TEXTILES PAPER LEATHER

AMERICAN DYESTUFF REPORTER

Including the Proceedings of the
AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

VOLUME XIV SEPTEMBER 7, 1925 NUMBER 15

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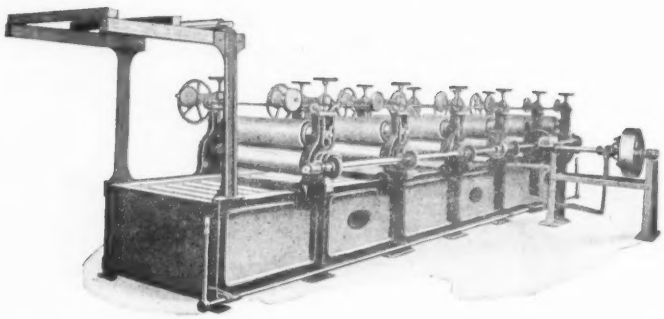

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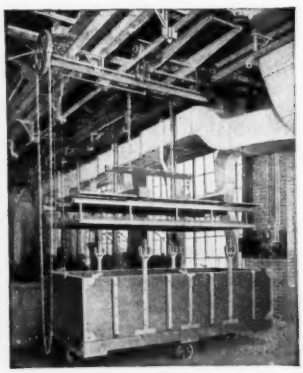

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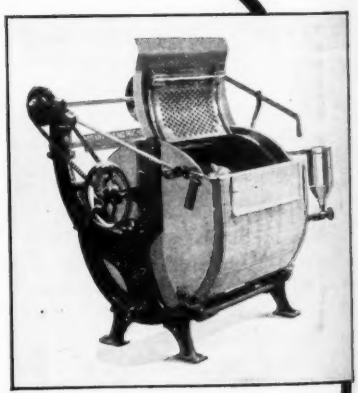

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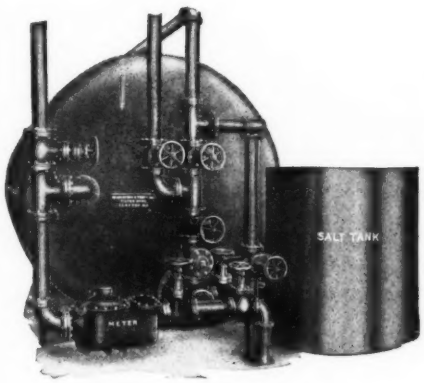

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VOLUME XIV NEW YORK, SEPTEMBER 7, 1925 NUMBER 15

The Classification of Raw Silk by Means of Mechanical Tests

PART II Raw Silk Properties and Defects Defined

Physical and Structural Properties—Color—Luster—Handle—Nature—Cohesion—Strength—Ductility—Evenness—The Gauge Reel and the Seriplane—Cleanness—Defects

By KARL R. MOORE

THE comparable properties of raw silk from which its quality is derived may be subdivided into two general classifications: (1) Physical properties, such as luster, handle, strength, etc., which are more or less inherent in the silk itself and can be determined by a visual inspection supplemented by the serimeter.

(2) Structural properties, such as evenness, cohesion, cleanness, etc., which are partly influenced by conditions within the control of the filature or reeling establishment, and which cannot be determined with any degree of accuracy by a visual examination or by any other method of examination except a mechanical measurement. These physical and structural properties which are examined in classifying silk in accordance with the system of mechanical measurement are as follows:

Color	Nature	Cleanness
Luster	Cohesion	Evenness
Handle	Strength	Ductility

Color.—Color runs from pure white down to a deep ivory in hue. This quality may be measured visually by comparison with certain standard skeins kept for this purpose. The color is somewhat influenced by the temperature and cleanness of the water in the basins during reeling.

Luster.—Luster may be classified as high, medium and low. High luster is a much sought after quality in raw silk, as it indicates a strong thread of high cohesion. This indication, however, only holds true when comparing silks of the same nature, and does not hold in comparing a hard natured silk from Kai with a soft natured Shinshiu. It is a good plan, however, to be slow in selecting a silk low in luster, and to test it very carefully for strength before purchasing.

Handle.—The handle of raw silk may be defined as silky, nervy, or spongy in accordance with the degree of resiliency which is experienced in handling it. The more resiliency the silk has in handling, the less liable it is to wrinkle when used in dress materials. This resiliency is really the elasticity of the silk itself.

Nature.—The nature of a silk may be classified as soft, medium and hard, and is due to a difference in the structure of the sericin or outer coating. Generally speaking, silks of a hard, dense nature come from the colder parts of the country and the higher altitudes and vice versa. It is well known that the hard natured silks resist the action of the soap in boiling-off for a longer period than the Shinshius, and that much of the trouble experienced in soaking and boiling-off is a direct result of inability to cope with the varying degrees of hardness in the nature of successive lots of raw silk. A simple practical test to determine the relative nature of the silk at hand is as follows:

Take one pound of castile soap and boil up in 3,000 c.c. of water. One hundred centimeters of this liquor is heated to 60 deg. Cent. About 2,000 yards of silk wound from eight different skeins onto separate bobbins is made into five small coils of 180 threads each, about one inch in diameter. These coils are tied in eight different places and dropped into the above solution, and the time noted that it takes them to drop to the bottom of the beaker. Soft natured Shinshius on this test will average around 15 to 20 seconds, while Kansai silks will take from 35 to 50 seconds.

Cohesion.—Cohesion is the force by which the filaments of the cocoon are agglutinated, and the measurement of cohesion is simply the measurement of the amount of mechanical force necessary to separate these filaments again. The cohesion figure is dependent upon two factors: (1) the structural strength of the sericin itself; (2) the number of turns of twist put in the strand when reeling from the basin. Low cohesion coming from

factor 2 is the cause of one of the greatest defects met with in throwing and weaving, known as split ends. Cohesion is measured on the cohesion machine. (Fig. 2) invented by Mr. Seem and its operation consists in rolling the thread under pressure until it opens.

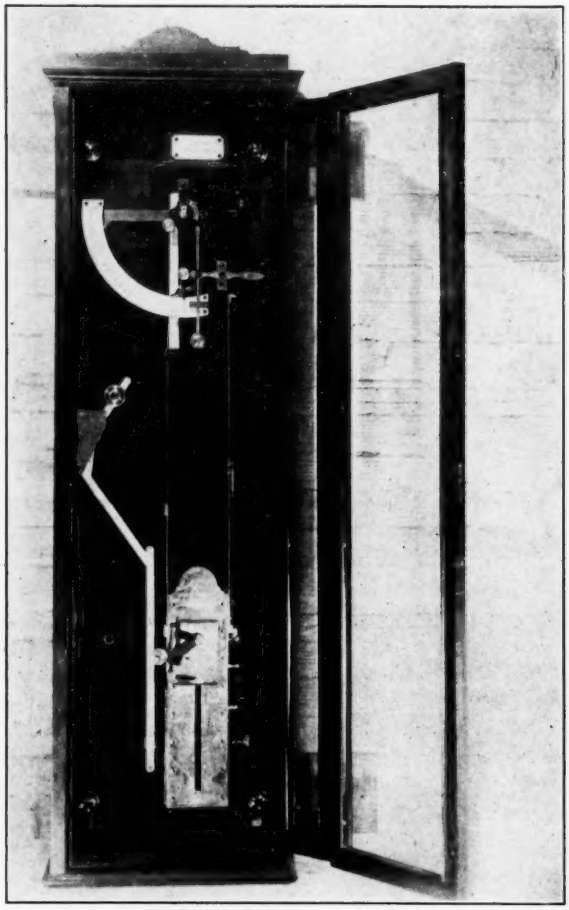

FIG. 1—*The Serimeter*

Strength.—Strength or tenacity is the resistance of the thread to breaking and is measured upon the serimeter shown in Fig. 1. Not much importance is attached to this test unless it is the average of a large number of tests, as the silk thread is of such varying diameter. A thread breaking at four times its denier size in grams is generally rated at 100 per cent for strength.

Ductility.—Ductility is measured simultaneously with the strength upon the serimeter. As this quality is almost entirely dependent upon the amount of moisture in the silk and the humidity of the surrounding atmosphere the result is not included in making up the quality report.

Evenness.—Evenness is the recording of the number of fine and coarse threads found in a measured yardage of silk. These fine and coarse threads are detected by winding the selected skeins from the bale onto bobbins and then running the thread from the bobbin through steel gauges through which the thread runs in a V-shaped groove which is graduated according to the different sizes of silk. After running through this groove the thread runs onto a calibrated reel with a counting device to show the yardage reeled. This apparatus is known as a gauge reel and is shown in Fig. 3.

Fine ends will be indicated by the thread running further down in the groove than it should for the size. When this happens it will be noted by the operator of the reel who will then test this thread for strength on a special scale made by the Toledo Scale Co. Coarse threads will be indicated by the thread breaking due to inability to pass through the groove at the size graduation point that agrees with its size on the bale. These coarse ends are tested on the scale as are the fine, and appear on the classification sheet which will be shown later. Evenness may also be compared by means of the seriplane test, on a machine brought out by Cheney Bros.

The process performed on this apparatus simply consists of winding silk from a number of bobbins upon black cardboard and visually comparing one lot with another. The objection to its use compared with the gauge reel (Fig. 3) is that the silk so wound off is wasted, whereas on the gauge reel it may be rewound onto bobbins and used in manufacture: also, the eye is somewhat deceived when inspecting for evenness by the large number of parallel lines upon the board. A preferable supplementary test for evenness is one recently employed by Mr. Seem, which consists in knitting up a piece of cloth of singles about 24 inches square. By boiling this off, dyeing black and mounting on white cardboard it gives an excel-

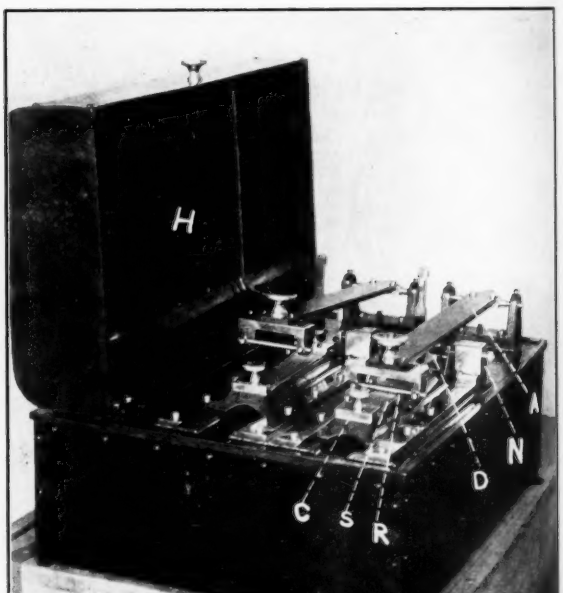

FIG. 2—*The Cohesion Machine*

lent supplementary comparison of silk for evenness. Many mountings from different lots that ran well in the mill may be used as comparison standards for evenness.

Cleanness.—Cleanness is the recording of the number of defects in a measured yardage of raw silk. These de-

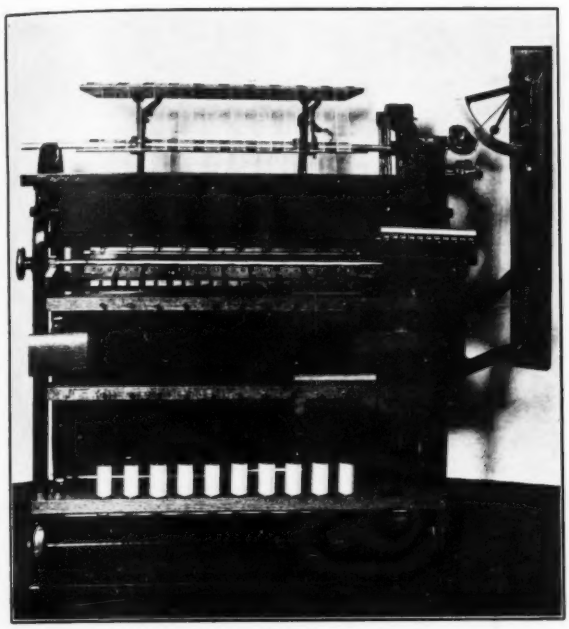

FIG. 3—*The Gauge Reel*

fects are found by running the unsoaked silk through the gauge reel and are classified and enumerated simultaneously with the making of the evenness test. Some of the defects such as loops and nibs, will pass through the groove and must be numerated by running off one hundred and fifty yards on the reel, and counting the number appearing in that yardage and multiplying this number by a factor to give the number that will be found in 300,000 yards or one pound of raw silk. Generally speaking, those defects that will pass through the grooves will not break out in manufacture and will not show in the finished cloth and are therefore classified as minor defects. There are also larger and more serious defects. These will break in the grooves of the gauges and will either break out in manufacturing or show in the finished cloth. These are classified as major defects. The following are the defects found in raw silk:

Slugs	Split ends	Nibs
Bad throws	Bad knots	Corkscrews
Waste	Hairiness	Loops

A commercially perfect skein of silk is in one continuous length without defects of such size as will not cover in weaving. A small knot which indicates cocoons running out will cover in weaving and is therefore not considered a defect. Raw knots are shown in I, Fig. 5 (page 582).

The number of these occurring in a measured yardage is enumerated, however, for the reason that often low grade silk is rereeled carefully and the major defects removed, and knots appear in place of these imperfections. By thus rereeling silk may be raised several grades in quality but the skein will show a much larger number of knots than is normally found. The ends of these small knots should not project more than one-eighth of an inch. For Italian silks these knots will run from 10 to 100 per pound of silk. Japan rereels they may run as high as 200 to 700 to the pound of silk.

Bad knots.—These are knots having ends on them from one-half to four inches long as shown in J, Fig. 5. They indicate poor reeling and cause trouble in throwing where nearly half of them break out. They should run in number about as follows in a pound of silk:

Crack Double Extra	0
Double Extra	3-10
Extra	10-20
Best No. 1 to Extra	20-30
Best No. 1	30-40
No. 1	40-100
No. 1 to 1½	100-150

Waste.—There will sometimes be found upon the thread an accumulation of waste fiber coming from the reeling basin with the filament. (See A, Fig. 5.) For uniformity in mechanically measuring the defects when this waste is twisted in or matted down tightly to the fiber it is called a slug but when loose and spreading in formation it is called waste. About one-third of these formations will break out in throwing. Waste will appear about as follows in the different qualities in one pound of silk:

Crack Double Extra	0
Double Extra	0
Extra	10-20

FIG. 4—*The Seriplane*

Courtesy Alfred Suter.

WASTE
SLUGS
BAD CASTS
SPLIT THREADS
VERY LONG KNOTS
A
B
C
D
E
LOOPS
NIBS
CORKSCREWS
RAW KNOTS
LONG KNOTS
F
G
H
I
J

Fig. 5

Best No. 1 to Extra	20-30
Best No. 1	30-60
No. 1	60-100
No. 1 to 1½	100-150

Nibs.—Nibs are very small slugs, as defined in the preceding paragraph. In differentiating between a nib and a slug, those defects which do not show when twisted into a 2-thread or 4-thread can be classed as nibs (See G, Fig. 5.) These are a very minor form of defect and do not show in the finished goods.

Loops.—Small loops are the most numerous cleanness defect and are generally caused during reeling, where one of the cocoons in the basin has become softened more quickly or immersed longer than the others. In reeling the silk slips off this cocoon with greater ease than from the others, causing little loops or kinks to appear in the reeled thread. (F, Fig. 5.)

Loops will run about as follows in the different grades per pound of silk:

Crack Double Extra	Below 50
Double Extra	50-100
Extra	100-200
Best No. 1 to Extra	200-300
Best No. 1	300-400
No. 1	400-550
No. 1 to 1½	550-600

Split Ends.—This serious defect does not show up in unsoaked silk, and it is for this reason that a supplementary winding test is made on soaked silk. This defect is caused by a disintegration of the unit thread, which as has been previously stated, consists of five or six cocoon filaments. The soaking of the raw silk dissolves the gum which holds the thread together at certain points and after being so divided the individual filaments break or snap when the gums are rubbed prior to putting on the swift and cause split ends where one or more of the component filaments has snapped off the main stem of the thread. The origin of the trouble goes back to the reeling basin where, in order to gain production, sufficient twist was not put in the thread and this short twist did not sufficiently knead in the component cocoon filaments to withstand the slight heat and alkali of the soaking and the thread opens and the end splits off. (See D, Fig. 5.) It might be added that this defect does not show up in the tests made by many conditioning houses where the silk is examined in an unsoaked condition.

Bad throws.—Those originate as a result of the reeler adding on one or more cocoon filaments in such a manner as to make the diameter at the point of juncture much larger than the regular diameter of the thread, due to the added filament not being welded into the thread. They are easily distinguished and are generally preceded by fine ends. They indicate inexperienced operators in the filature. (See C, Fig. 5.)

Corkscrews.—These are caused by uneven tension on the cocoon in reeling and are caused by the same conditions that cause loops. (See H, Fig. 5.)

(Part III will appear in an early issue.)

Preliminary Stages in Wool Dyeing

Dyeing Affinities—Variety of Dyestuffs—Wool Scouring—Classes of Wool—Scouring Lyes—Used Lyes—Use of Alkalies—Organic Solvents—Some Disadvantages—Faulty Scouring—Carbonizing—Temperature and Concentration

By J. STEPHEN HEUTHWAITE

AMONG the various animal fibers which the dyers is called upon to bring to greater perfection sheep's wool plays by far the greatest part. A less extensive use is made of the fleeces of other animals, the most important of which are mohair, obtained from the Angora goat; alpaca, a similar material, and cashmere, derived from a species of goat living in Central Africa. The hair of the camel, the llama and vicuna, the cow and calf, as well as horsehair, are occasionally used for certain goods, and the hair of hares and rabbits is largely employed in the manufacture of hats.

Although the chemical character of the various kinds of wool and hair is pretty much alike, there are nevertheless slight differences in their behavior in dyeing, so that the affinity of the dyestuffs for the various fibers differs more or less. As a general rule, the finer the fiber of wool or hair, the more dyestuff will it absorb in producing a given shade, since, under equal conditions, the finer fiber, presenting a larger surface in properties to the bulk, takes up more dyestuff than the coarser fiber. Hence it follows that it is advisable to use only a material of as uniform a fiber as possible for goods which are to receive a smooth felt-like appearance through milling and are to be dyed in the piece. It follows also that difficulties will arise by employing simultaneously wools from different kinds of animals, unless it is intended to produce a contrast between the various fibers.

Dyeing Affinities

Generally speaking, the process of dyeing sheep's wool applies to other animal fibers, apart from slight variations which their structure necessitates for obtaining greater

or less affinity for the dyestuffs. It is therefore not necessary to discuss specially the mode of dyeing of these special fibers, since their treatment can easily be gathered from what is said about wool dyeing. On the other hand, goods made of wool and cotton and containing a larger proportion of the latter for cheapening purposes, must be treated separately since, in such cases, not only is the cotton to be dyed, but is is to appear the same color as the wool. Special methods must be adopted and suitable dyestuffs selected for these materials; the initial and after-treatment of the goods differs vastly from that applied to wool fabrics.

It cannot be denied that of all fibrous substances adopted by the human race for clothing, decoration of dwelling and other purposes, none has met with such universal and manifold employment as sheep's wool. Naturally the claims made upon the product vary with the great many uses to which the material manufactured from it is put. Whereas the dyeing of military cloths is expected to be proof against wind and weather, the chief demand in material for ball dresses is beauty of shade. The yarn to be used for stockings must retain its color in the laundry washing, while the material for window curtains must above all withstand the influence of sunlight.

Variety of Dyestuffs

It has been the endeavor of the coal tar industry to meet all the various claims made in practice upon the properties of the dyestuffs, and it may be affirmed that with a great number of dyestuffs placed upon the market by the different color manufacturers all possible and widely ranging demands can be satisfied. However, for that very reason the selection of a suitable dyestuff for a particular purpose often becomes very difficult.

Corresponding to the many uses of woolen goods their mode of production varies, and consequently the dyeing operation is carried out at various stages of the manufacture. Considering that the succession of the latter has a certain connection with the ultimate effects, styles, and the demands upon fastness, I intend to deal with the separate branches of the industry in accordance with the successive stages of manufacture in which woolen goods are dyed, viz.:——

1. The dyeing of loose material.
2. The dyeing of slubbing.
3. The dyeing of yarn.
4. The dyeing of price goods.

Loose wool as it comes from the sheep's back is not in a fit condition for manufacturing. It contains from 20 per cent, to 70 per cent. of pure wool and, according to the class of sheep and their mode of living, a larger or smaller amount of chemical impurities (sand and other earthy substances, remains of excrement and many kinds of vegetable matter), and finally a considerable quantity of wool grease. Wool grease is composed of alkaline salts of the various organic acids, mostly belonging to the higher fatty acids and of insoluble fats. Both substances are secretive products of the adipose and sudatory glands of the skin.

Wool Scouring

The object of wool scouring is to extract the grease and to remove the dust adhering to the fibers. By this process the wool becomes more open and is thus more suitable for spinning on the one hand, and for the absorption of mordants and dyestuffs on the other. Simultaneously with the grease, mineral admixtures and mechanical impurities are also removed. The last traces of these are finally got rid of in willowing, spinning and the other operations.

A scouring is the most important of preparatory treatments to which the wool is subjected before dyeing, and is a fundamental condition for good results, especially in dyeing, this subject must be treated rather exhaustively.

Some wools are washed or partly cleansed on the living animal with the object of removing part of the wool grease. Foreign wools are frequently treated in the same manner after shearing in order to save freight. In large establishments the raw so-called greasy wool is often subjected to reparatory treatment by steeping in and washing with water. The soluble parts dissolved by the water consist mostly of potassium salts; the liquid is gradually evaporated and the grease residue further treated, yielding finally the valuable by-product, potash.

Nowadays, preparatory scouring is only very rarely resorted to because experience has shown that the previous extraction of the soluble alkaline salts is not always an advantage for the cleaning of wool. Since these salts are, in regard to their chemical composition, soaps, their intimate mixture with the grease assists the saponification of the latter when brought into reaction with alkalies.

Hence the preparatory scouring is at present dispensed with and the greasy wools are treated direct in diluted alkaline solutions for the purpose of grease extraction, i. e., both the soluble and insoluble elements of the wool grease are removed in a single operation. More frequently soda is employed as alkali; also potash, ammonia, putrid urine, and soap lyes are used.

Sometimes also certain salts, such as common salt or sal ammoniac, are added to the scouring liquor, together with the alkali, in order to accelerate the scouring process. An addition of oleine to the scouring lye is also frequently made for the purpose of forming by its reaction upon the alkali an emulsion with the wool grease and thereby accelerating the solution.

Classes of Wool

According to their degree of purity wools are distinguished as:—

1. Greasy wool, i. e., wools shorn without preparatory cleansing.

2. Fleece scoured wools, i. e., which have thereby already been partially freed from wool grease.

(*Continued on page* 603)

Adhesives in Dyeing Cotton and in Making It Waterproof

Nature of Fabrics in Which Adhesives Are Employed a Machine for Adhesive Application—Formula for an Adhesive Paste—Casein as an Adhesive—Acetate of Alumina for Waterproofing

By W. B. NELSON

ADHESIVES, as distinguished from cements, may be defined as substances or preparations of a gummy or gelatinous character used for the purpose of joining together or effecting the mutual adhesion of the surface of bodies.

Solutions of gum arabic, or of dextrine, or British gum, mixed with acetic acid, are frequently employed in the case of paper. Flour or starch mixed with water containing a little alum, so as to form a thick cream, which is then heated to boiling and when cold mixed with oil of cloves, thymol, phenol or salicylic acid so as to preserve it, makes an effective adhesive for cotton goods. A transparent paste may be made by the use of rice starch instead of ordinary flour.

At this present time there is an increasing demand for styles of goods in which two or more of the fabrics are superimposed one upon the other and are pasted together, the one, that forms the outside, being the fabric itself, and the other being the lining or inside part of the stuff.

By way of example we may mention gun cases and cheap cases for musical instrument makers; the outside maybe dyed duck or other suitable cotton cloth and the inside lining of canton flannel; in this case the two cloths, the outside being drab or other suitable color made of duck with an inside lining of scarlet flannelette, are dyed separately and then pasted together in the finishing, i. e., before cutting.

There is also the case of white canvas shoes; in this case the outside is made from bleached duck and the inside, or lining, is made from bleached or unbleached drilling both are pasted together and are cut together in the same operation. In this case it is necessary that, if the shoes are for vulcanizing, the goods themselves and the paste should be *thoroughly bleached* and made alkaline with ammonia before cutting to prevent the goods from turning brown during the operation of vulcanizing and if the goods are not for vulcanizing they should be finished alkaline with borax or acetate of soda and some powerful antiseptic to prevent them from turning other colors in the cases.

Again in the case of hunting coats made of canvas it has been found that a low price lining made from woolen or cotton sweepings can be pasted to the dyed canvas before cutting, so that one cutting and one stitching would serve both for the material and its lining and in fact there are many ways in which the pasting process can be made valuable.

The advantages of this process are quite obvious, both economical and otherwise, and there is no doubt that in these days of efficiency the demand for this kind of work will increase and grow larger, and therefore it may not be amiss in this paper to show how the pasting may be effected both as regards facility and thoroughness.

The goods ought to be stuck together so that they will hold through all the vicissitudes of rolling, cutting and making up or handling around the shop, and the paste manufacturers will furnish (in barrels) the exact kind of pastes that are needed to fulfill all these requirements.

It was found for all ordinary purposes that it was only necessary that the goods should be pasted together temporarily so as to allow of their being cut and sewed together, and that a simple flour paste would fill all requirements if applied by a machine somewhat like Fig. 1; but it has gradually begun to occur to finishers that more permanent and better results could be gained by using a paste that was more adhesive and would stay so to some degree; hence it is better to get a machine built entirely for this purpose from the machinery builders and a paste already made (in barrels) by the dealer.

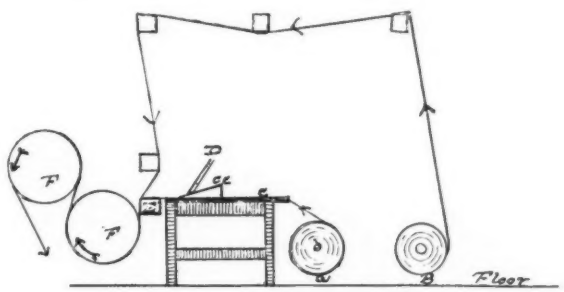

Fig 1

In Fig. 1, the roll of dyed goods to be lined is represented at (a) and is drawn across the table (C) by the steam heated drying cylinder (F) over the lower tension rail (E). The paste is thrown on to the slowly travelling goods at the point (CC) on the table (C) and is distributed evenly and regularly and the surplus is scraped off by the doctor blade (D). The lining of the goods which is represented by the letter (B) is made to pass under and over the spreader bars as shown by the arrows and comes together in close contact as they are pressed together over the tension bar (E). They are pressed firmly together at this point and their passage immediately in

intimate contact with each other over the drying cylinders (F) completes the operation and they are stuck together.

It is quite within our province to say that a roller in place of the lower bar (E) would not answer so well and we would say still further that any pressure, beyond that already mentioned, that may be used to press the two fabrics together while the paste is wet, will work positive injury to its adhesiveness. Please remember that it will not stick the lining on unless there is a full, unbroken layer of free paste between them and that any pressure that will have a tendency to force the paste through and into the interstices of the cloth, i. e., away from their contact surface, will prevent them from sticking together.

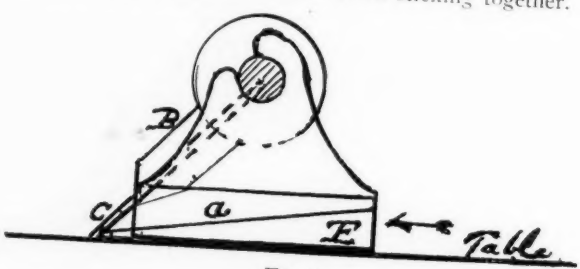

FIG 2

It is necessary that the doctor should exert nothing but its own weight on the goods. The blade of the doctor should be of composition so that it will not rust nor corrode and set into a pair of heavy doctor shears, as shown in Fig. 2. In this cut (a) represents the standard, (B) the doctor shears, (C) is the doctor itself and (D) is the table across which the goods are passing in the direction of the arrow. The thickness of the film of paste spread upon the goods is controlled by the two inclined planes (E) one-half of one inch wide and inserted under the blade of the doctor on the table at each side of the travelling goods: it will be seen at once that by advancing or retreating these inclined planes and thus raising or lowering the edge of the doctor blade the thickness of the film to be applied can be easily controlled. All paste should be used hot.

A Paste Formula

If it is necessary to make a paste that is more adhesive than the flour paste alone and a paste that will stick the goods and the lining together in a more permanent way it may be advisable to take:

Borax	13 ounces
Sal soda	17 ounces
Sal ammonia	13 ounces
Granulated sugar	8 pounds
Flour	13 pounds
Water	18 gallons
Thoroughly mix cold; then add:	
Water	17 gallons

Turn on the steam and boil for 10 minutes, making 25 gallons of paste altogether. This must be made alkaline with borax if for canvas shoes. If it is for vulcanizing it must be made alkaline with ammonia; in both cases the goods must be thoroughly bleached to pure cellulose.

The above makes a very smooth, adhesive paste and it requires a great deal of force to pull it apart. It is best, however, to buy your paste from the maker, ready made, explaining to him exactly what is wanted; this is much better and more reliable than attempting to make it yourself.

It is quite obvious that it must be an advantage to a shoe manufacturer to cut both his stock and its lining at one and the same operation or a sporting goods maker to do the same thing with his gun cases or sporting coats or hunting materials. These fabrics would be all the more his advantage if they could be pasted together permanently or if they could be rendered waterproof both of which considerations are perfectly practical if the paste or filling is made right.

Rubber is out of the question; though it may stick all right when first put on, and is waterproof and can be cut with its material, it is airproof, and does not feel good to the wearer; the next best thing to use as a paste, especially for hunting coats is casein. Rubber moreover is friable and does not wear well.

Casein

Casein is the chief albuminate in milk, in which it is present as calcium caseinate and, according to some authorities, not as a neutral salt, but as calcium dicaseinate combined with calcium phosphate. Calcium caseinate may possess the property of maintaining in solution the neutral calcium phosphate which is also present as one of the constituents of the milk; or the milk may perhaps contain a double salt of calcium caseinate and calcium phosphate (chemists are not decided on this point). In any case the calcium phosphate is thrown down when casein is precipitated from milk along with the total milk fat, the emulsification of which is therefore due to calcium caseinate. To a great extent this explains the reason of the great difficulty that is usually experienced in getting casein free from fat and casein-phosphate. Free casein is quite insoluble in water but the neutral borax, sodium or ammonium salts are quite soluble, hence it is clearly indicated that if any of these neutral salts are applied in solution to the goods as paste or otherwise and are then rendered insoluble by the removal of the alkaline base, leaving in this way a film of insoluble casein on the goods, the fabrics must be stuck together and to a great extent, waterproofed.

Calcium caseinate is hardly available to make paste for dyed goods as it does not entirely dissolve. Owing to the carbonate of lime present it makes an opalescent looking mixture, but sodium caseinate and ammonium caseinate make clear solutions and therefore their use is indicated. The sodium caseinate is known as nutrose and the ammonium caseinate as eucasin. Casein is precipitated

from solutions of these salts, and also from milk, by weak mineral acids or by acetate of lime or alumina. An acetate is redissolved if the precipitating acid is in excess.

Casein acts like all alluminoids in that it is precipitated from its solutions and is rendered insoluble by most of the salts of the heavy metals.

The employment of casein as an adhesive is of rather an old date but it is only lately that it has received any serious attention. It has been found to be one of the most adhesive substances known if thoroughly dissolved and applied to the goods and afterwards is rendered insoluble by means of formalin or some of the heavy metals; it then becomes absolutely adhesive and waterproof.

Casein Glue

The best way of making a casein glue for pasting alone is to dissolve commercial casein in a saturated solution of borax and then thin down. If it is for waterproofing it may be run (after drying) through soap water and acetate of lime or alumina. This is one of the strongest adhesives known and it finds much employment as a substitute for glue and gum arabic.

The borax solution is made by dissolving about one pound of borax in six quarts of water. The casein is prepared by mixing about three pounds of casein in ten quarts of water until it is thoroughly wet out by constant stirring. The borax solution is then stirred in with a gentle heat until the casein is completely dissolved; the heat from a steam pipe is to be preferred. A still better way is to mix three to five pounds of dry casein in ten quarts of water and to add ammonia slowly, at a gentle steam heat, until complete solution takes place. Either of these ways of mixing will make a cement (antiseptic added) which will paste goods together permanently, the latter method rendering the goods insoluble and waterproof to a degree by the evaporation of the ammonia solvent; this happens of course during the process of drying the goods. A little castor oil added to the paste will make the pasted goods softer and more pliable and will not interfere with their adhesiveness to any appreciable extent.

Casein, as the dictionaries define it, is curd milk, sold as a powder under the name of lactarine. It is prepared by precipitating skimmed milk with dilute acids, all fatty matter being previously removed. It dissolves readily in ammonia, the alkaline carbonate, borax and lime water, with which it forms feeble combinations. It is used in calico printing as a substitute for albumen. It is not coagulated by steaming and can only serve for colors requiring a moderate degree of fastness. It is used as an animal mordant but only on account of its cheapness.

Goods may be rendered quite rainproof and still pervious to air if they are first run through a cold solution of acetate of alumina at about 7 deg. Tw. and allowed to stand, preferably all night, then dried and run hot through a mixture of casein, ammonia and soap.

The acetate of alumina may be prepared by any of the known ways but it is best to allow an excess of the alum salt to prevail. The fabric must be quite free from all excess of acetic acid, though it need not be perfectly dry; it is best to thoroughly dry it. The soap combines with the alumina and forms an insoluble casein, which adheres so that no water or mechanical means can remove it. It is possible that some undecomposed soap may remain on the fiber, giving the goods a slippery feel. This can be easily remedied by passing the goods through a weak alum bath at 1 deg. Tw. and washing and drying. Above is for showerproofing single colored goods or gray goods.

NEW TYPE OF ILLUMINATION FOR MICROSCOPES

A new method for the illumination of microscopic specimens has been made possible by the use of rods of clear fused quartz. The facts that quartz absorbs a very small portion of the light and has a high melting point make its use in this work advantageous. The light conveyed through a solid quartz rod is sufficiently brilliant to illuminate high power objectives without the additional use of substage condensers. The rod also gives better detail than the ordinary methods of illumination. The ends of the rod are ground uniformly, but not polished. Diffused light thus obtained obviates all trouble from images of the filament. It is also possible to work farther from the light source to avoid heating of specimens.

Miss S. B. Leiter, metallographist in the research laboratory of the General Electric Company, has been obtaining satisfactory results with several types of clear fused quartz illuminators. For use with the ordinary small microscope, a half-inch quartz rod with a right angle bend is used. The light source is a small moving-picture lamp with the lens removed. The intensity of the light is regulated by a rheostat. There is less loss of intensity than when the light is reflected from a substage mirror, and the light can always be directed to the stage of the microscope where wanted.

In the case of the inverted type of microscope, where illuminating a transparent specimen has presented difficulties, the use of quartz rods is especially convenient. Since intense heat does not shatter quartz, one end of the quartz rod can be placed immediately over an arc, and better illumination conveyed to the specimen.

Readers who are interested in New York City's freight transportation problem should read the booklet that has just been issued by the Port of New York Authority, entitled "Improved and Economic Freight Service for Manhattan—Universal Inland Freight Stations and Industrial Terminal Buildings." As no publishers' address is given in the booklet we cannot supply more definite information as to where it may be obtained. It is attractively illustrated with plans and diagrams, and its twenty-five pages contain a surprising amount of information on present freight conditions in New York.

Dyeing Acetate Silk

Part XIII

(*Continued from page 578*)

The Duranol Dyes for Acetate Silk—Azonine Direct Dyes—Dispersal Yellow 3G—Newport Dyes for Acetate Silk—Stripping Dispersal Dyes—A Dispersal Method of Improving Light Fastness of Acetate Silk Colors—Bibliography of Patent Literature on Dispersal Dyes

By CHARLES E. MULLIN, M.Sc., F.A.I.C.

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ANOTHER variety of dispersal dyes is the Duranol dyes of the British Dyestuffs Corporation. These are prepared dispersions of water insoluble compounds, in the form of pastes, which resemble the SRA dyes. No doubt some of them are very similar products, and it has been stated that some of them are azo compounds, while others are anthraquinone derivatives. These pastes are not prepared by means of sulphoricinoleic acid or soap, but some special medium is used. (See British Patent No. 214,246 and German Patent No. 303,121, which follow.) These dispersions are claimed to have excellent stability even in the dye bath, and show no tendency to precipitate. At present four colors are available: Duranol Orange G, Duranol Red G, Duranol Red 2B and Duranol Blue G. Mr. Davies states that other colors—as, for instance, yellow, violet and black—will be available shortly. These are also sold as 10 per cent pastes, which only require dilution with water to the desired strength for application. Possibly they could also be printed on acetate silk fabrics.

Method No. 85: The Application of the Duranols to Acetate Silk.—The acetate silk is entered cold and the temperature slowly raised to 75 or 80 deg. Cent. (167 to 176 deg. Fahr.) for one-half to one hour. They work well in combinations, level well, and have no particular affinity for the vegetable fibers. They may be used with most direct and acid dyes in either acid or alkaline dye baths, or with the addition of salt or Turkey Red oil. Turkey Red oil aids in leveling, but retards exhaustion, and for this reason should not be present in over two or three parts per part of dye.

Duranol Blue G dyes wool to almost the same shade as acetate silk from an acid bath, and they all stain wool from a neutral or alkaline bath. The dyeing properties of the orange and reds are not materially affected by the presence of either acid or alkali. They have excellent fastness to washing, alkalies, acids, perspiration, rubbing and particularly to light, and have good fastness to cross-dyeing and the usual fulling.

Azonine Direct Dyes and Azonine SF for Acetate Silk

Another variety of acetate silk dyes is the Direct Azonines. These are also suitably prepared dispersions of the insoluble compounds which have an affinity for acetate silk. In applying these dyes the silk is scoured as in Method No. 5, and is then ready to enter the dye bath.

Method No. 86: Direct Azonines on Acetate Silk.—The dyestuffs Azonine Direct Yellow 2R Paste, Azonine Direct Red G Paste, Azonine Direct Violet R and Azonine Direct Blue B Paste are dissolved with the addition of approximately the same weight of soap as of dye in boiling, very soft water. This concentrated solution is strained into the dye bath, previously heated to 60 to 70 deg. Cent. (140 to 160 deg. Fahr.) In dyeing light shades it is advantageous to add sufficient soap to the bath to bring the total soap content up to 5 to 8 ounces per 10 gallons of dye bath. In case hard water is used, it is best to replace the soap with Monopole soap or a similar product which is not precipitated in hard water. The dyes level well and the wet-out acetate silk is usually entered into the dye bath at about 60 to 70 deg. Cent. (140 to 160 deg. Fahr.) and dyed at this temperature for thirty to forty-five minutes, without further addition, and then rinsed well.

Method No. 87: Azonine SF on Acetate Silk.—Azonine SF is dissolved in boiling water containing twice the weight of soap as of dye to be dissolved. This solution is strained into the dye bath previously heated to 60 to 70 deg. Cent. (140 to 160 deg. Fahr.) The scoured acetate silk is entered at this temperature, worked for about forty-five minutes and rinsed. It is then diazotized for fifteen or twenty minutes in a cold bath containing 2.5 ounces sodium nitrite and 8 ounces 34 deg. Tw. hydrochloric in 10 gallons of water, and thoroughly rinsed.

Method No. 87A.—The developing bath is prepared by first dissolving 1 pound of Developer ON in 1 to 3 gallons of water containing 2 pounds sodium acetate. This

concentrated solution is added to the developing bath in such proportion that when ready for use it will contain about 2.5 ounces of Developer ON per 10 gallons of bath. In other words, 1 pound of Developer ON and 2 pounds of sodium acetate will make up a developing bath of 64 gallons. The wet, rinsed, diazotized acetate silk is immediately entered into this bath at 45 to 50 deg. Cent. (115 to 120 deg. Fahr.), worked for twenty to thirty minutes, and then rinsed well.

When applied in this manner, these dyes level well and give colors of very good fastness to rubbing, washing and light. As they do not appreciably stain cotton, they may readily be used in obtaining two-color effects on unions containing acetate silk and cotton. In dyeing such unions the acetate silk should be dyed first and then the cotton dyed at not over 40 to 60 deg. Cent. (105 to 120 deg. Fahr.), with the addition of sodium sulphate but without soda ash, using dyes that do not stain the acetate silk. The following dyes are recommended for the cotton:

Diamine Fast Yellow B
Diamine Fast Yellow G
Diamine Fast Blue FFB
Diamine Fast Red Violet FR
Diamine Fast Brilliant Blue R
Diamine Fast Blue F3G
Diamine Fast Yellow 4G
Oxydiamine Black JW Ex. Conc.

Good bright shades are obtained with 6 to 7.5 per cent of Azonine Direct Yellow 2R Paste, Azonine Direct Red G Paste, Azonine Direct Blue B Paste or a good black with 2 per cent Azonine SF diazotized and developed with Developer ON.

Formula No. Y1: Greenish Yellow—
0.75 per cent Azonine Direct Yellow 2R Paste; 0.14 per cent Azonine Direct Blue B Paste.

Formula No. Y2: Bluish Gray, Medium—
0.7 per cent Azonine Direct Yellow 2R Paste; 1.6 per cent Azonine Direct Blue B Paste; 0.2 per cent Direct Red G Paste.

Formula No. Y3: Reddish Tan, Medium—
0.14 per cent Azonine Direct Yellow 2R Paste; 0.7 per cent Azonine Direct Blue B Paste; 0.4 per cent Azonine Direct Red G Paste.

Formula No. Y4: Light Tan—
0.38 per cent Azonine Direct Yellow 2R Paste; 0.15 per cent Azonine Direct Blue B Paste; 0.3 per cent Azonine Direct Red G Paste.

Formula No. Y5: Brownish Tan, Medium—
4 per cent Azonine Direct Yellow 2R Paste; 2.2 per cent Azonine Direct Blue B Paste; 0.7 per cent Azonine Direct Red G Paste.

Formula No. Y6: Dark Chestnut Brown—
3.3 per cent Azonine Direct Yellow 2R Paste; 3.3 per cent Azonine Direct Blue 2B Paste; 1.7 per cent Azonine Direct Red G Paste.

Formula No. Y7: Green, Medium—
3.3 per cent Azonine Direct Yellow 2R Paste; 3.3 per cent Azonine Direct Blue B Paste.

Formula No. Y8: Dark Blue Gray—
6 per cent Azonine Direct Blue B Paste; 0.7 per cent Azonine Direct Red G Paste.

It is claimed that Azonine 2R is Aminoazotoluene.

Dispersal Yellow 3G Paste

The manufacturers of the Duranol dyes have recently offered a yellow, under the name of Dispersal Yellow 3G. This is applied by the same formula as the Duranols, Method No. 8, with about the same results, except that the fastness to light of the new product is not as good as that of the Duranols.

Newport Dyes for Acetate Silk

Newport Azo Sudan, Azo Yellow B, Azo Orange, Azo Red and Azo Blue may also be applied to acetate silk by the dispersal method. These water insoluble products are just dissolved in Turkey Red or other suitable soluble oil and may then be applied in a soapy dye bath in the same manner as the other dispersal dyes. Azo Sudan, Azo Yellow B and Azo Orange give shades of excellent strength and brilliancy but have a tendency to crock. This crocking may be entirely remedied by working the dyed acetate silk in a cold bath containing 2 per cent of caustic soda, on the weight of the goods, for 20 minutes. This treatment does not seriously weaken the shades but no doubt saponifies the acetate silk to some extent. Azo Red and Azo Blue do not crock and therefore this after-treatment is unnecessary. These colors are only moderately fast to light but wash well.

A number of the Anthrene as well as other water insoluble vat dyes of suitable constitution may also be applied to acetate silk by the dispersal method after dissolving in sulphonated oil or other water soluble dispersing medium. Indigo as well as some of its compounds in the unreduced state have been obtained in the colloidal condition by means of the dispersal process, but most of them have only a very slight affinity for acetate silk. This is particularly true of Indigo itself.

For certain purposes the use of a highly sulphonated castor oil in preparing the dispersal dyes in an advantage over the use of Turkey Red oil. When Turkey Red oil is used only alkaline or neutral dye baths may be used, but with the highly sulphonated product an acid bath may be employed and in dyeing acetate silk-wool unions in a combination dye bath this is certainly an advantage. Certain organic solvents, such as glycerol, epichlorohydrin, ethylene chlorohydrin, napthalene-formaldehyde condensation products, etc., have been suggested. Some of the solvents products discussed "Solvent Dyeing," in Part VII, may also be applicable, as well as some of the new hydrogenated solvents, such

as Tetralin, Hexalin or Decalin. Some of these are now made in America by the Newport Chemical Works.

Stripping Dispersal Dyes

The dispersal dyes do not usually strip very easily, but they can often be slightly stripped in a soapy bath at 80 deg. Cent. (176 deg. Fahr.), containing considerable suphoricinoleic acid or any other solubilizing agent used in their application. Hydrosulphite may be added to assist the above. Where a more drastic action is required a treatment similar to Method No. 35 may be given. The formaldehyde-sulphoxylates, acidified with formic acid, have also been used at 80 deg. Cent. (176 deg. Fahr.). The sulphoricinoleic acid stripping treatment as above has been used to level the unevenness of light shades, due to faulty application. Possibly the reducing substances, such as stannous chloride or hydrosulphite are best suited for resisting the dispersal dyes, but this type of dye is not particularly adapted for the work.

A Dispersal Method of Improving Light Fastness of Acetate Silk Colors

Ellis recently stated that the fastness to light of many dyes which are more or less fugitive to light, is improved by the presence on the acetate silk or certain colorless organic compounds of a basic nature, such as aniline, B-naphthylamine, benzidine, etc. Certain dialkylanilines, such as dimethylaniline, are particularly effective. These products are applied by the dispersal method; that is, they are dissolved in a dispersing agent such as sulphoricinoleic acid, and this is added to the dispersal dye bath, or applied in a subsequent bath, the basic compound being absorbed and retained by the acetate silk due to its high affinity for basic compounds. Generally 2 to 5 per cent of the protective agent is sufficient, and the odor is not noticeable. Spectroscopic research upon the cause of this phenomenon indicates that after this treatment the acetate silk absorbs all rays below about 3,400 A. U.

The following abstracts from the recent patent literature covering the dispersal dyes and their methods of application are of interest in that they give more definite information as to the compounds used in, and the constitution of, the dispersal dyes, their methods of manufacture, as well as additional information regarding their application. The patents are given in their numerical order, which is an index as to the sequence of applications. Apparently the first patent on this process was British Patent No. 211,720.

According to British Patent No. 211,720, to the British Dyestuffs Corporation, J. Baddiley and A. Shepherdson, March 8, 1923, acetate silk may be dyed yellow to blue shades in an aqueous dye bath containing aminoanthraquinone dyes in colloidal solution or suspension. The presence of emulsifying agents, such as Turkey Red oil, in the dye bath, is advantageous. In this manner 1-aminoanthraquinone gives a yellow shade; 1-amino-2-methylanthraquinone gives a yellow-orange; 1-methylaminoanthraquinone a red; 1, 4-diaminoanthraquinone a violet; 1, 5-diaminoanthraquinone a red; diaminoanthrarufin a blue; 1, 4-aminohydroxyanthraquinone a crimson and diaminoanthrarufin when methylated in one or both of the hydroxy groups, a sky blue shade.

Farbenfarbriken Vorm. F. Bayer & Company in British Patent No. 214,246, April 14, 1923, cover the dyeing of acetate silk with solutions prepared by dissolving unsulphonated dye bases of the triphenylmethane, anthraquinone or other series in glycerol, epichlorohydrin, ethylene chlorohydrin, or other organic solvent and diluting this solution with water to obtain the base in a finely divided state. Its colloidal condition may be improved by adding glue, gelatin or Turkey Red oil to the bath. For instance: Methyl Violet 6B base, China Green base (p,p'-tetramethyldiaminotriphenylcarbinol anhydride) or Alizarine Geranol base can be dissolved in ethylene chlorohydrin, diluted with water, glue or Turkey Red oil added, and the acetate silk dyed at 50 to 60 deg. Cent. (122 to 140 deg. Fahr.).

Possibly the process covered by German Patent No. 303,121, Aug. 8, 1916, to S. Aschkenasi may also be applicable for the production of dispersal baths of vat or other insoluble dyes suitable for application to acetate silk. This patent states that pastes of insoluble dyestuffs may be prepared by the addition of so-called "fat splitting" agents, such as Twitchell reagent, hydroricinoleic acid, napthalene sulphonic acid splitter, etc. Indigo pastes may be prepared by adding one to three per cent of the fat splitter, on the weight of the dye, and stirring with water. The preparation is discussed, but it is claimed that at least fourteen times as much Turkon oil is required to give the same emulsifying action as the fat splitters, therefore the latter are more suitable for concentrated pastes.

The splitters may also be used as an addition to the dye bath to produce emulsification and thus allow the use of neutral or acid hydrosulphite vats. In this method, the splitter is added to the ordinary alkaline vat, after reduction by hydrosulphite, at a temperature of not over 40 deg. Cent. (140 deg Fahr.). In the case of Indigo, the addition of 1 to 3 per cent of Twitchell reagent, on the weight of Indigo, is recommended. Thioindigo Scarlet is also mentioned as particularly suited for application by this method.

British Patent No. 219,349, Jan. 27, March 17, and May 22, 1923, to the British Celanese, Limited, formerly the British Cellulose & Chemical Manufacturing Company, and G. H. Ellis, gives considerable detail regarding the dispersal dyes. As this company manufactures the SRA dyes, we may assume that it very largely covers these products. According to this patent, dyes which are capable of coloring acetate silk, but which are too insoluble in water to be applied

by the usual methods, may be treated with the higher fatty acids, or their derivatives which contain salt-forming groups, such as sulphoricinoleic, oleic, stearic or palmitic acid, or their alkali or ammonium salts, to form colloidal solutions or dispersions and thus become sufficiently soluble or dispersed to allow their use in the commercial dyeing of acetate silk in aqueous dye baths.

A wide range of insoluble products may be applied by this method. The simple aromatic amino bases may be applied in this manner for the production of insoluble azo colors, and they may be used either in the impregnating or developing bath or in both. Many unsulphonated azo dyes, unreduced dyestuffs of the Indophenol and Indigoid classes, basic derivatives of the anthraquinone series, and the color bases of diphenylmethane, triarylmethane, oxazine, azine, and thiazine dyes may also be dispersed by this method. In general most of the dyes or compounds must be in the form of free bases, and should contain no sulphonated groups for the reasons previously given. Other substituent groups, such as primary, secondary and tertiary amino groups, nitro, nitroso, hydroxy, methoxy, or halogen groups may be present, and where a free primary aromatic amino group is present, it may be diazotized and developed on the fiber by the methods given under the Developed Dyes.

To prepare the soluble product, the dyestuff or other organic compound to be used is mixed, with or without heat, with the free fatty acid, or its alkali or ammonium salt, the resulting mixture being subsequently diluted with water, or a solution of alkali, boiled, and filtered through cloth into a dye bath which may be either neutral, acid or alkaline. If desired, suitable dyeing materials may be converted into "solid solutions" or complexes by heating them with the appropriate oily body followed by the requisite treatment to render them fit for transport.

Dyes dispersed in this way may be used, with or without the addition of other dyestuffs not deleteriously affected by the solubilizing agents for dyeing, printing or stencilling fabrics containing acetate silk in unions with other fibers or threads, the non-sulphonated azo dyes being preferentially fixed by the acetate silk, leaving the cotton, wool, silk and regenerated cellulose artificial silks unstained or but slightly stained. These latter fibers may be subsequently or simultaneously dyed with suitable dyestuffs which have no affinity for the acetate silk. The Indophenol type of dyes are very suitable for blue and violet shades, as in Methods No. 45 and No. 92, and benzeneazobenzeneazo-B-naphthol (Sudan III), 4-nitro-2-methoxybenzene-1-azodiphenylamine, and aminoazonaphthalene are also used.

Method No. 88.—For example, pink and red shades may be obtained on acetate silk by treating 4-nitro-2-methoxybenzene-1-azodimethylaniline with sufficient oleic acid to dissolve it on heating, and then pouring the hot solution into hot water containing enough ammonia or sodium carbonate to neutralize the fatty acid. This mass is filtered into the dye bath.

Method No. 89.—An orange shade on 100 kilos of acetate silk may be obtained by heating 1 kilo of finely ground p-nitrobenzeneazodiphenylamine with 10 liters of 50 per cent sodium sulphoricinoleate. This is diluted with boiling water and boiled, after which it is added to the 30 to 1 dye bath and the yarn dyed in the usual manner, raising the temperature to 65 to 75 deg. Cent. (147 to 167 deg. Fahr.) if necessary.

Method No. 90.—A scarlet shade on the same quantity of acetate silk may be obtained with 1.5 kilos of aminoazobenzene and 15 liters of 50 per cent sodium sulphoricinoleate. After dyeing, rinse the stock and diazotize as in Method No. 70A. Then rinse again and develop in a solution containing three lios of dimethylaniline and in 20 liters of 50 per cent sodium sulphoricinoleate, prepared in the same manner as the red dye above.

Method No. 91.—In a similar manner, 25 kilos of a fifty-fifty acetate silk-cotton union fabric may be dyed, the acetate silk a bluish-red shade and the cotton a blue shade. Heat 250 grams of finely powdered 2, 4-dinitrobenzene-1-azodiethylaniline for 10 minutes at 100 deg. Cent. (212 deg. Fahr.) in 5 liters of 50 per cent sodium sulphoricinoleate. This dispersed by compound is diluted with boiling water boiled, and filtered into a 750 liter dye bath, and the union entered. When the acetate silk has reached the desired shade, the material is removed from the bath, rinsed in warm water and the cotton dyed a blue shade in a dye bath containing 376 grams of Chlorazol Fast Blue 2B. Possibly Diamine Fast Blue FFB, Direct Fast Blue FF or Solamine Blue FF could also be used for the cotton.

Method No. 92.—The Indophenols may also be applied by first converting them into water soluble bodies by treatment with fatty acids or sulphonated acids giving soluble sodium or ammonium salts, such as sulphoricinoleic acid. Glue may also be used. For instance, 500 grams of diethyl-p-amidophenyl-1 : 4-naphthoquinonemonoimide may be ground with 2 liters of water and this added to 2,000 liters of water containing 4 kilos of glue. The dyeing is carried out at 40 to 70 deg. Cent. (104 to 158 deg. Fahr.). The glue may be omitted if the dyestuff is first dissolved in a suitable solvent and poured into water to obtain a fine suspension. (Also see Method No. 45.)

In British Patent No. 222,001, Nov. 27, 1923, to A. J. Hall and Silver Springs Bleaching & Dyeing Company, it is stated that acetate silk may be dyed yellow to red shades of excellent fastness, especialy to washing, light and chlorine, by means of 2, 4-dinitrochlorobenzene derivatives, produced by condensing 2, 4-dichlorobenzene with aromatic compounds containing one or more amino groups, but no sulphonic acid groups. For instance, 2, 4-dinitrodiphenylamine and its 2'-or4'-hydroxy derivative, 2, 4-dinitro-2'-hydroxydiphenylamine or 2, 4-dinitro-4'-hydroxydiphenylamine; the carboxyl derivatives 2, 4-dinitro-2'-carboxydiphenyla-

mine and 2, 4-dinitro-4'-carboxyldiphenylamine; 2, 4-dinitro-4'-aminodiphenylamine, 2, 4-dinitro-4'-acetylaminodiphenylamine and 2, 4-dinitro-N-methyldiphenylamine, may be used for dyeing acetate silk directly from a solution or dispersion in water at 75 deg. Cent. (167 deg. Fahr.) Turkey Red oil soap or ammonia may be added to the bath. Cotton or artificial silk are not stained.

In British Patent No. 224,077 Oct. 19, 1923, and United States Patent No. 1,534,019, April 21, 1925, to the British Dyestuffs Corporation, Baddiley, Hill, Laurie, Shepherdson and Swann, it is proposed to disperse water-insoluble, or nearly insoluble dyes, which have an affinity for acetate silk in the condensation products of naphthalene or naphthalenesulphonic acids with formaldehyde. Dyes such as those specified in British Patent No. 211,720 are suitable and such dispersing agents may be used to dye acetate silk a yellowish-red with the monoazo dye prepared from diazotized p-nitroaniline and diphenylamine; or violet-red with a dispersion of 1, 4-diaminoanthraquinone. These products may be mixed with direct cotton dyes for use on unions, etc. Pastes containing these protective colloids and suitable dyes may be evaporated to dryness and ground to a powder for shipment or storage. Some such process may be used in the preparation of the Cellit dyes, which will be described later.

Excellent black shades on acetate silk may be obtained without double diazotization and double coupling by the method covered in British Patent No. 224,359 (1923), to Lawrie, Blackshaw and the British Dyestuffs Corporation. In this process bases such as a-naphthylamine, benzidine, toluidine and p,p'-diaminodiphenylamine are applied to the fiber in the free condition, or are produced on the fiber in this state by known methods, e.g., hot dispersions in such liquids as aqueous alcohol to Turkey Red oil. A "basic" salt of the base may be used and the base subsequently liberated on the fiber by means of sodium carbonate. It can then be diazotized and developed with B-hydroxynaphthoic acid or resorcinol in a slightly acid bath. The fact that reddish azo dyes are ultimately obtained from the same base when they are applied in the ordinary manner, that is without the liberation of free base, is said to be due to the small amount of dyestuff on the fiber, whereas by this process a much larger quantity of the base and consequently a correspondingly larger amount of dyestuff is present on the acetate silk.

In British Patent No. 224,681, Oct. 11, 1923, to British Celanese, Ltd., Ellis Stevenson and Croft, it is stated that acetate silk may be dyed, printed or stenciled by means of nonsulphonated pyrazolone compounds, particularly the nonsulphonated azo derivatives. For instance, azo dyes prepared by coupling unsulphonated diazo compounds with 1-phenyl-3-methyl-5-pyrazolone, beneneazo-1-phenyl-3-methyl-5-pyrazolone, 1, 3-dimethyl-5-pyrazolone, p-methoxybenzeneazo-1-phenyl-3-methyl-5-pyrazolone and dimethyl-p-amino benzeneazobenzeneazo-1-phenyl-3-methyl-5-pyrazolone. The dyes may be used in solution with caustic soda or dissolved in an organic solvent miscible with water and then mixed with water, or may be dispersed in sulphoricinoleic acid or other solubilizing or dispersing agents as described in British Patent No. 219,349. These dyes may be used in conjunction with others for dyeing mixed goods containing acetate silk together with cotton, silk or wool, usually giving yellow to orange shades.

In British Patent No. 224,925, May 22, 1923, to Ellis and the British Cellulose and Chemical Manufacturing Company, they state that it is of some advantage to substitute carbocyclic compounds containing salt-forming groups for the sulphoricinoleic acid compounds specified in British Patent No. 219,349, as the solvent or dispersing agent. Suitable compounds are given as naphthenic acids and naphthalenesulphonic acid or other carboxylic sulphonic acids of the cycloparaffins, phenols, and the sulphonic, carboxylic, and phenol-sulphonic acid derivatives of the benzene, naphthalene or anthracene series. In certain cases it may be of advantage to use the above in combination with the older reagent, i. e., sulphoricinoleic acid. For example: One pound of m-nitrobenzeneazodiphenylamine is finely ground and heated with 9 pounds of naphthenic acid until homogeneous, sufficient caustic soda being then added to give the product a slight alkaline reaction. After filtration this is suitable for direct addition to the acetate silk bath.

Method No. 93.—British Patent No. 227,183, October 19, 1923 (addition to British Patent No. 219,349), to Ellis and the British Cellulose & Chemical Manufacturing Company, covers the use of vat dyes of the anthraquinone class, such as Indanthrene, Cibanone, Algol, etc., stabilized as in the main patent. For example: One pound of Algol Pink R (1-benzoylamino-4-hydroxyanthraquinone) is made into a paste with 9 or 10 pounds of 50 per cent sodium Turkey Red oil previously heated to 90 deg. Cent. (194 deg. Fahr.) and the heating continued until the dye is dissolved. This paste is diluted with a boiling 3 to 5 per cent solution of neutral soap, and this mixture added to the 300 to 500 gallon dye bath. The above is sufficient to dye 100 pounds of acetate silk after which it is rinsed, dried, etc. It is possible that many other vat dyes may be applicable by the same process, as for instance Indanthrene X (N-dihydro-1, 2, 1', 2'-anthraquinoneazine), Indanthrene Bordeaux B (6, 6-dichloro-2, 2-dia-a-anthraquinonyldiaminoanthraquinone), Algol Rose B (1-benzoylamino-4-methoxyanthraquinone), Algol Scarlet G, Algol Yellow WG, (1-benzoylaminoanthraquinone), Algol Violet B (1-benzoylamino-4, 5, 8-trihydroxyanthraquinone), etc.

The manufacture of acetate silk dyes, which are apparently intended to be applied by the dispersal method is discussed in British Patent No. 227,923, Oct. 25, 1923, to the British Dyestuff Corporation, Paddiley and Tatum. It states that dyes having an affinity

for acetate silk may be prepared by condensing the 1, 5-dichloro derivatives of anthraquinone with two molecules of anthranilic acid. The value of these dyes is enhanced when they contain amino or hydroxy groups in the para-position to the aminobenzoic residue. For instance, 4, 8-diphenylaminoanthrarufin-o, o'-dicarboxylic acid (from 4, 8-dichloroanthrarufin) dyes acetate silk a greenish-blue; and 4, 8-diphenylamino-1, 5-diaminoanthraquinone-o, o'-dicarboxylic acid (from 1, 5-dichloro-4, 8-dinitroanthraquinone, the nitro groups being reduced with sodium suphide after condensation) gives acetate silk a green color.

Clavel in United States Patent No. 1,517,709, Dec. 2, 1924, covers the application of dyes in suspension to acetate silk and cotton or other acetate silk-unions. In this process the cotton may be dyed to shade in the usual manner by a sulphonated dye which has no affinity for acetate silk. After rinsing, the acetate silk is dyed in a bath containing an insoluble dye such as Indulin in suspension, in the presence of acetic acid, at about 60 to 72 deg. Cent. (140 to 160 deg. Fahr.). The dyed fabric is given a final treatment at 32 deg. Cent. (90 deg. Fahr.) in a bath containing acetic or formic acid and an emulsion containing olive oil and olive oil soap. The dyeing process may be reversed if desired, so as to dye the acetate silk first. Probably many vat and other dyes are applicable to acetate silk by this method.

(Part XIV will appear in an early issue.)

Recent Developments in the Chemistry of the Cotton Fibre

Cotton and Its Processing—Physical and Chemcial Structure—Experiments with Dyeing Properties of Acetyl-Cellulose—Action of Carbonyl Chlorides—Alteration of Esterified Fibre—Immunized Cotton.

By DR. G. TAGLIANI (Basle)

A STUDY of the morphological, physical and chemical properties of the textile fibers has led within recent years to a reasonably exact knowledge of their constitution, and hence to a clearer understanding of their behavior during dyeing and other operations. If the mechanism of the dying process cannot yet be considered as entirely clear, whether regarded from the standpoint of mechanical (solid solution, adsorption or contact action) or chemical theory, still the material now available gives us abundant insight into the mutual reaction between dyestuff and fiber.

Before the dense fluffy fiber of the seeds of the cotton plant is in a condition suitable for use in the making of cloth it must pass through a number of mechanical and chemical operations, the cleaning, willowing and carding directed towards the making of silver, roving and yarn, the twisting and sizing of the yarn so obtained, the weaving together of warp and weft with the production of woven cloth, and the treatment of this gray material with cleansing agents such as soap and caustic lye, and with bleaching agents such as hypochlorites.

Only after all these operations are the seed-hairs freed from their natural and adventitious impurities, such as, for example, fatty matters, waxes, pectins, soil and dirt, and a fully purified cotton is obtained.

In view of the many processes indicated above further treatment of the cotton would seem to be scarcely possible, especially when it is remembered that each mechanical and chemical operation through which it passes must cause some alteration in structure, elasticity and appearance—indeed, even in the very stability of the substance itself. That this is not so can be seen from the further drastic operations to which today the cotton fibers is subjected, such for example as treatment with hot or cold concentrated acids and alkalies as in mercerization processes. It is remarkable that by such drastic treatment the physical structure of the cotton fiber is not destroyed, nor the cellulose complex itslef broken down, but in these operations we have arrived at the verge of such a possibility and here and there can be seen the beginnings of such decomposition. The object aimed at is the preparation of the purest possible cotton fiber having certain definite new properties which all satisfy the growing requirements of trade.

Physical and Chemical Structure

In natural raw cotton the individual fibers are inextricably interming'ed, have irregular thickened edges and all carry their burden of corticular and resinous matter. After the bowking and bleaching processes they are free from all extraneous substances and are smoother, more lustrous and of better transparency. A pronounced parallelism of the separate fibers still further indicates the marked effect of the mechanical and chemical operations through which they have

passed. Moreover, cotton purified by the action of acids and alkalies exhibits a higher affinity for organic and inorganic compounds and for dyestuffs.

Furthermore, the basic chemical structure of cotton is itself variable. The main constituent is of course true cellulose, but associated therewith is a certain amount of more or less hydrated cellulose, accompanied frequently by hydroxyamylcellulose and as recent work shows, xanthoproteins.

If by drastic chemical treatment decomposition and destruction of the fiber cell occurs, the original properties of the substance disappear. For example, the various salts and esters of cellulose form colloidal solutions when dissolved in suitable solvents, and these, when mechanically conveyed in suitable form into solutions which act as precipitants, or in some cases solely by the action of a higher temperature, can be made to gelatinize, giving artificial fibers.

The unform, lustrous and silk-like capillary threads so obtained exhibit a somewhat different behavior from cotton towards dyestuffs solutions, although the artificial fiber must be regarded as a regenerated cellulose. The porosity, swelling properties, ability to resist without loss of strength hot aqueous solutions, and resistance against high temperatures in general are all considerably diminished, which would be inexplicable if the artificial fiber had the same structure as the original cotton fiber; in fact, denitrated nitrocellulose and cellulose regenerated from viscose show properties similar to those of strongly hydrated cellulose, such, for example, as an increased affinity for dyestuffs (especially for direct cotton colors). On the other hand, the acetylated derivatives of cellulose differ materially in this respect, since, owing to their essentially acidic character they possess no affinity for the direct cotton colors, while still being capable of absorbing readily dyestuffs containing basic groups and diazotizable amino bases. Should the acetyl-cellulose, however, be subjected to partial hydrolysis, a regenerated normal cellulose is obtained, though at the cost of a loss of both weight and appearance.

Experiments with Dyeing Properties of Acetyl-Cellulose

The choice of suitable dyestuffs and suitable dyeing methods for acetyl-cellulose silk is no easy matter, and it is of a special interest to ascertain how bright and level shades may be dyed on this material in admixture with other fibers.

The special dyeing properties of acetyl-cellulose have also been observed in the acidic and sulphonic acid derivatives of cellulose and in oxidized cellulose, all of which bodies show a resistance, more or less marked towards the absorption of direct cotton colors, together with a greater affinity for colors of a basic nature. By noting the depth of color produced by the absorption of diazotizable amines, followed by a treatment with phenols, the reactivity of oxidized cellulose has recently been made use of to ascertain the degree of oxidation which has taken place.

A somewhat cheaper material, having no appearance of an artificial fiber but produced by a treatment of loose cotton or yarn, which without altering its physical structure will confer upon it dyeing properties similar to those possessed by acetyl-cellulose, would undoubtedly be of marked importance to the textile industry particularly for the production of cross-dyed cloths containing white or colored effect-threads.

Early attempts to obtain such results involved the impregnation of the goods with suitable drying oils, or, alternatively the production on the fiber of certain higher metallic oxides. With these, however, as also with certain other proposed methods, the uncertainty of the results obtained, the fact that both fiber and dyestuff were liable to attack by the reagents used, and also that, viewed from a commercial aspect, the processes were uneconomic and of low efficiency militated seriously against their practical adoption.

The solution of this problem of obtaining two-color and white and colored effects in piece-dyeing must naturally begin by an examination from a purely chemical standpoint of the possible alterations of cellulose, and it is only by virtue of many observations and trials carried out in this direction that a satisfactory solution has now been achieved. As an example may be cited the slight acetylation of cotton in an acetic acid atmosphere. This reaction, which appeared quite possible, had been used at an early date in Indigo discharge work. Indigo dyed piece-goods were printed with a nitrate and were passed through an acrolein or acetic acid atmosphere, when a discharge was effected. The action of acetic acid on cotton gives results which are by no means uniform, even in presence of catalysts, and even the gentler acetylation indicated above, while causing no injury to the fiber cell, produces a result which leaves something to be desired on the score of strength.

The conversion of cotton cellulose into its mono- and di-benzoate, stearate and palmitate, by which under given conditions the fiber structure is scarcely altered, must be regarded as of great interest from the standpoint of the production of perfectly stable esters of high molecular weight. Certain known reactions frequently appear in the case of cellulose to take place with rapidity and to be uncontrollable in practice at the point where an alteration in the physical structure occurs and where new and desirable dyeing properties first exhibit themselves. It would take too long to mention all the numerous and interesting trials which form a part only of the large amount of laboratory work already carried out, but we may rest assured that the future will surely indicate many new and useful paths for the textile industry.

Action of Carbonyl Chlorides

The action of the carbonyl chlorides of mono aromatic acids on the sodium compound of cellulose (to which attention has been called by earlier workers) indicated a line of research which promised well, although it is well known that compounds produced by the interaction of pure sodium-cellulose and acid chlorides of aromatic acids (such as benzoyl, phthalyl, or naphthoyl chlorides, etc.), are readily saponified by alkalies and cannot therefore be regarded as of good stability. However, by permitting the acid chlorides of aromatic sulphonic acids, i. e., sulphonic chlorides, to react under suitable conditions with sodium cellulose in presence of inert solvents it is found that stable sulphoesters of cellulose (cellulose aryl sulphonates (?)) are formed, comparable in their permanency with the original textile material from which they are derived.

Suitable sulphonic chlorides for this purpose are ortho- and para-toluene sulphonic chlorides, naphthalene sulphonic chloride and analogous bodies prepared from substituted aromatic hydrocarbons, together with the chlor-, brom and nitro-derivatives of these compounds. In practice, on the score of cost, it is found desirable to use para-toluene sulphonic chloride.

It is improbable that the chemical combinations referred to can occur in absolutely quantitative fashion in a collection of fibers, and should an attempt be made to carry the reaction to completion it is likely that a total destruction of the cellular structure of the cotton would ensue. This possibility must be guarded against in any technical process based on the foregoing reaction. The conversion of the cellulose of the fiber into hydrated cellulose must take place in such manner that esterification proceeds in successive layers. Actually, the outermost layers of the fiber are swollen by the alkali treatment, and are hence in a highly reactive condition, while the inner portions of the fiber are in a state of compression. In consequence the permeability of the fiber taken as a whole is unequal, and while the outer layers readily react with the esterifying agent, the inner layers are to a large extent protected from its action. By a suitable regulation of temperature it is possible to bring the reaction to an end at this point. Under these conditions the final result of esterification may be regarded as definite and unalterable, since it is found possible to repeat the whole process of esterification on cotton already esterified without producing any further change. At present it is not possible to give an exact and precise explanation of the mechanism of the reaction, but it is at least certain that the formation of the cellulose ester in a fiber-bundle (as yarn) and most probably in a single cotton fiber occurs peripherally. This can readily be demonstrated by treating the esterified yarn by a suitable solution capable of dissolving cellulose, and examining the material obtained by subsequent precipitation.

From this we can see how it is that the structure of esterified yarn and of the single esterified cotton fiber exhibit so little physical alteration when compared with the original material—from a technical point of view, a most important fact. We are also better able to consider what necessary precautions must be taken when dyeing such esterified cotton since we know with some accuracy the limits to which it is possible to go.

Alteration of Esterified Fiber

The single cotton fiber, esterified by treatment with p-toluene sulphonic chloride, is altered in certain particulars as compared with untreated cotton; it is whiter in appearance, less transparent, less lustrous, has a lower hygroscopicity and is thicker. As yarn it possesses a fuller handle and a lower wetting-out capacity, and shows no loss of resistance as compared with ordinary cotton towards such operations as bleaching with chlorine compounds or treatment with cold concentrated caustic lyes, sulphuric acid or nitric acid. In consequence of these useful properties it may be employed in figured goods which are subsequently to be mercerized, either by acid or alkaline processes or have to be given the "Philana" treatment. It is seen, therefore, to possess a more pronounced resistance than is found among the group of artificial fibers.

Cellulose so altered by the action of sulphonic chlorides comes on the market under the name of "Immunized Cotton."* This name indicates the capacity of the material to resist the dyeing action of the direct cotton colors. The immunity is dependent on the purity and degree of twist of the yarn on the one hand and on both constitution and solubility in water of the dyestuff on the other. Immunized yarn exhibits at least as great, if not a greater affinity for basic colors, and for certain special acid colors and Gallocyanines having a basic character as do the acetyl silks. This yarn, moreover, readily absorbs solutions of diazotizable amino-bases, so that its possibilities of employment are fully as interesting as those of acetyl silk, more so perhaps, since cotton, first dyed with suitable dyestuffs, can then be immunized, giving dyeings of greatly enhanced fastness when compared with similar dyeings on untreated cotton. The use of white and colored effect-threads in cotton, half-wool and mixed goods opens up new possibilities of design and treatment in the textile and dyeing industries, since by this means all manner of white and colored stripes, checks and patterns can be initiated on piece-dyed goods. Moreover, the conversion of cotton into immunized cotton can be carried out locally on either yarn or piece goods by the aid of suitable mechanical apparatus, whereby the inital formation of

*Manufactured solely by the Sandoz Chemical Works, Basle, Switzerland.

sodium-cellulose is followed by esterification of the material over chosen areas. These new and purely chemical reserve effects can be employed so as to produce many and varied color contrasts, and carry the process into the wider area of color-printing. It becomes possible in this way to obtain white and colored reserve effects according to the choice of acid or basic and direct dyestuffs which may be applied together in the same bath. It is also possible to print white and colored discharges on the top of such effects with the production of complex multicolor prints.†

It can therefore be seen that the immunization process contains great possibilities in its application. A further and very interesting line of research has opened to us a fresh door in showing that viscose may itself be converted into acetyl and sulphoacetyl compounds. This leads to the consideration of converting existing artificial silks, dyed or undyed, into corresponding new immunized silks. Conditions of working have, however, to be considered here, for the swollen, heavily polymerized cellulose fibers do not readily wet out and certain textile operations are thereby slowed down or partially inhibited.

As we follow these changes we cannot but feel astounded at what can be obtained from a single cotton fiber, and what the future holds for us in possible permutations of cotton and of artificial fibers of vegetable origin. For the chemical laboratory remains the problem of building still further on the foundation of facts already known and of bringing to completion the work which is already commenced. When this is accomplished an advance will have been made which will have far-reaching effect on the economic and technical development of both the chemical and textile industries.—*Journal of the Society of Dyers and Colourists.*

†Similar results may be obtained by the use of the para-toluene sulphonic ester of cellulose dissolved in suitable solvents and applied as a print base.

Practical Hints on the Production of Bright Colors on Textile Fabrics

Part XVII

A Rinsing Machine—Its Operation and Advantages—A Topping Machine—Construction and Operation—Features—A Two-Roller Slop-Padding Machine—Construction, Operation and Advantages

By RAFFAELE SANSONE

SHOULD it be required to render basic colors faster, especially on heavy goods, the material is given an after-tanning process on another plant, followed by a rinsing that could be conducted to advantage on an apparatus constructed by the Waggon und Maschinenfabrik A-K. of Gorlitz, Germany, and constructed on the principle shown in Fig. 1.

This consists of two light iron sides (F), joined together by transversal bars to form a sort of stand, on which are sustained four very shallow troughs (A, B, C, D) of copper-plated iron, glass, or other similar material. The interior of each trough has the two guiding rollers indicated in each case by b a, d c, g h, and k m. Sides F are supplied with the supplementary guiding rollers c, f, i and n, and with special lower bearings for supporting a beam of the cloth (M) to be rinsed, supplied with a brake.

At a certain height above these are placed the spreading bars E, and at the top of the plant a pair of squeezing rollers (S), supplied with light elastic pressure by levers and weights (L); and two high iron arms (G) supporting a plaiter that forms the cloth in pieces on a lower wagon running on wheels, on a truck or simply on a wooden table.

Trough A has on the right a discharge tube leading its contents into trough B, which has on its left a discharge tube leading into trough C, which has on its right a discharge tube leading into trough D, that discharges the first rinsing water given to the cotton goods into the waste water main on its left. The plant is driven through fast and loose pulleys, and all movement can be started or stopped from the front or back by moving the hand levers K and J.

Work on the Plant

For conducting work on the above plant a tape is passed between the spreading bars E, and from here successively on binding rollers n, m, k, f, g, h, i, e, d, c, b, and a, drawing it after this upward through the nip of the rollers S, after having raised the levers and weights L, which are, however, replaced soon after by the plaiting mechanism P.

Water is then run into the first shallow trough A from an upper tap, and is allowed to pass in close succession through the troughs B, C and D just below, and from the last of the same directly into the waste water main. When in this way all troughs have been filled, a roll of the cloth to be rinsed is entered in the

bearings already indicated on the front of the machine, applying the brake to stop all slipping, and arranging a slight tension. When this has been conducted, the beginning of the cloth is sewn to the end of the tape, and the machine is started.

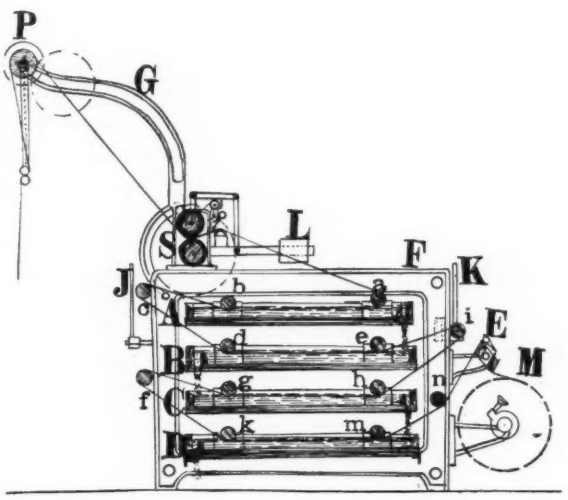

FIG. 1

The material is thus carried forward into trough D, where binding rollers m and k keep it in contact with water running in the same direction, which effects the rinsing of the material. From here it makes its way through rollers f, g and h in contact with the water of trough C, passing upward again by rollers i, e, d in contact with the water in trough B, entering after this directly into trough A and receiving the last contact with water and being pressed between rollers S, leaving the plant by plaiter P.

Through the above arrangement the material receives cleaner water as it rises in the apparatus, coming in the end, and when nearly completely clean, in contact with the water as it issues from the tap. Besides this it comes in contact with the water running in the same direction all through. Should it be wished to treat the material on the counter stream system the position of the discharge tubes is inverted on each trough, and the water entered on the right instead of on the left. So that the water entering the shallow troughs should not all pass out by the discharge tubes, leaving them empty; just before each of them is placed a partition, above which the bath mounts only when a certain height has been reached.

The plant indicated in Fig. 1 has the following advantages that are well worth the notice of dyers:

1. Reduced quantities of rinsing water are required to obtain a thorough rinsing of the material.

2. The forced regulation of the rinsing fluid along the whole length of the cotton fabrics and across the width of the machine causes no trouble whatever.

3. Owing to the small height of the water in troughs A, B, C, D, the lighter and heavier impurities are eliminated without difficulty.

4. The machine is easily worked, and if the necessary precautions are taken the employment of labor is not great.

5. The operators can observe every portion of the material as it is passing through, noting unevenness, stains, weaving defects, etc.

6. A large economy in space is assured in comparison with other rinsing machines.

A Topping Machine

For economizing on the use of basic colors for the topping of fabrics dyed in direct colors, some dyers conduct only a superficial covering with the basic, which is quite sufficient in many cases in obtaining the required brightening effect. A cheap means used by them is the one-oxide padding machine. Through this a limited quantity of a suitable basic color is applied on the front of the fabric, leaving there, after drying, a thin layer of basic and direct color lake. A plant that has found a certain employment for this purpose is constructed on the principle shown in Fig. 2.

Here is to be seen a solid iron frame F, the lower portion of which sustains a wetting cylinder of bowl O, dipping for at least one-half in a shallow copper-plated iron trough containing the topping bath. Above cylinder O, and at the back of the plant is roller (K). This is supplied with light pressure applied by side levers and weights, and can be raised to a certain height to bring the cotton fabric out of contact with wetting cylinder O.

Before wetting cylinder O is a guiding-in and tension-giving mechanism N, the action of which can be

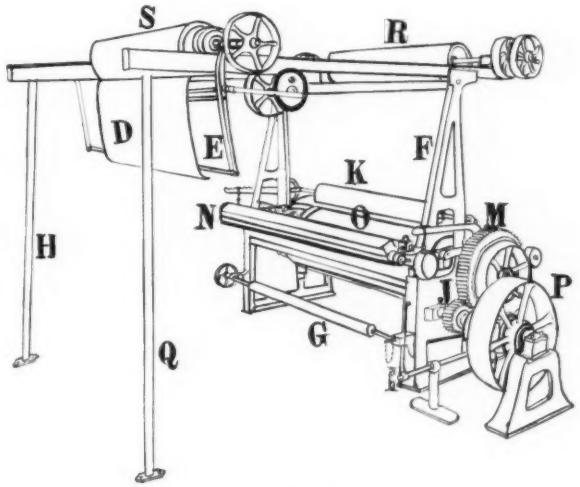

FIG 2

regulated through a side screw; and just below are bearings for introducing the supporting rods of the wooden beam G, on which the fabric to be topped is unwound. Wetting cylinder O is turned at a certain speed through pulley P, and the large pinion wheel M is turned at a certain speed through pulley P, and the large pinion wheel M and small pinion wheel J, the driving of pulley P taking place in preference from an upper transmission.

The upper portion of the plant contains a guiding-out or draw-roller R, from which the topped cotton cloth is led onto roller S, and from here against a round copper plate D on plaiter E. For supporting conveniently rollers R and S the upper part of framing F is fixed to upper bars, the ends of which lean on the iron rods Q and H.

The cloth passes round the upper part of bowl O, which is preferably of iron covered with a copper coating of at least 1 inch thickness, and its close contact prevents the coloring bath from passing through, especially if this is of sufficient thickness. The surplus topping bath on bowl O is removed by a heavy doctor provided with powerful levels and weights.

After the cloth has left the bowl, the surface of the latter is cleaned from any lint or fibers that may be present by means of another doctor. Both doctors are provided with a longitudinal traversing motion to insure their working evenly and without grooving. In some machines a mechanically driven agitator mixes the coloring bath, keeping the contents of the same strength all through, especially if the necessary additions of fresh bath are made from time to time.

Work on the above machine is quite simple, and can be easily mastered by any willing workman. For the purpose the operator raises roller K and threads in two short cotton tapes, the ends of which are joined to the beginning of the first piece to be topped, causing them to pass through disposition N. On the other side of the machine such tapes are passed below roller K, mounting after this onto rollers R and S, and falling down against plate D.

When this has been conducted, the operators enter the topping bath into the trough below bowl O, starting the machine. Bowl O thus turns at a certain speed, receiving over its round surface a fixed quantity of the dye bath, regulated through an engraved space in the same, and through the front doctor already indicated.

When the cloth begins to pass through the guiding-in arrangement N, roller K is lowered and this causes it to press against bowl O under a certain tension, taking up most of the color bath present on the same, which thus forms a very thin layer above the ground color already present on the fabric. On leaving roller K the colored portion comes in contact with rollers R and S, and descends onto plaiter E to be transformed into pieces in a small iron wagon, or on a truck ready for carrying to the drying and finishing compartments.

The Advantages of the Plant

The above plant has several important advantages. Some of these can be indicated as follows:

1. The cotton fabric, that has been previously dyed in the direct colors and dried, can be coated once or twice on its front with a very thin covering of the basic dyestuff, according to whether it is given one or two passages through the machine.

2. As the coloring is conducted only superficially the amount of basic color used is small, and its effect quite sufficient for many purposes.

3. Through regulating the depth of the engraved or lower surface of the wetting bowl O, and thickening the topping color, a larger or smaller quantity of this

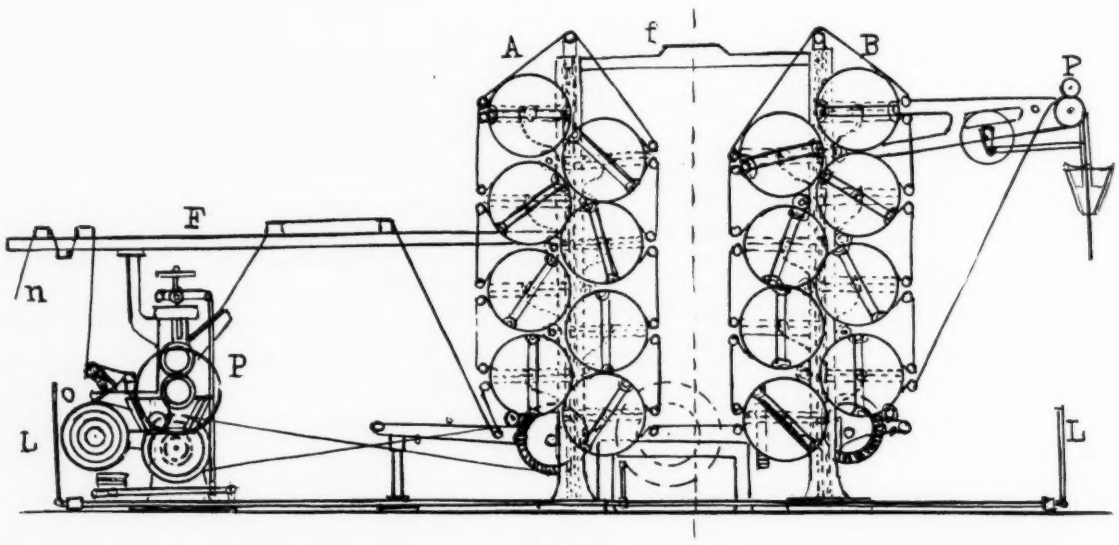

Fig. 3

can be applied to the material in accordance with requirements.

4. The production of the plant is large, especially if one side of the fabric is treated.

5. Through two passages in the machine the topping can be conducted first on the front and then on the back of the cloth.

6. Should it be required, the fabric dyed in the direct color can be topped at one side with one color and at the other with another color.

7. Each side of the fabric can be given a double topping, first with one color and then with another.

Another Plant

In some works a two roller slop-padding is often employed in place of the one side padding plant indicated above, and it can be useful for other padding operations, such as soaping, coppering, chroming, etc., when a treatment with basic colors is not necessary.

A plant that the writer has seen at work, and through which the cloth is dried immediately after the topping, avoiding the necessity of intermediate transportation operations, is constructed on the principle indicated in figure 3.

This shows a plant composed principally of a padding machine P, and of a double drying machine, A and B. The padding machine has a substantial iron framing carrying two bowls, of which the top is usually of rubber and the lower of iron covered over with brass or copper. A trough fitted with two glass or copper binding-rollers is furnished underneath, which can be raised or lowered by means of rack-motion and of a hand wheel. The bowls are supplied with compound lever pressure.

The cloth can be entered in this instance either from a wooden beam placed at the bottom of the machine on side bearings, supplied with brake for preventing permature unwinding; or can be entered from piece-form as shown at n, and in this last case from above a top frame with spreading bars, placed on the upper rails F, which are also joined to the drying portion of the plant, give extra solidity to the same.

The padding machine is modified in this instance in comparison with other similar machines. Around its lower pressure bowl is caused to revolve continuously an endless copper band, which also turns on the two binding rollers in the trough, and during the working of the plant picks up a portion of the dye bath and brings it in contact with the exposed face of the material being padded. To prevent an excess of the topping bath and to regulate the quantity of this that finds its way to the fabric, this endless copper band has an engraving running for a certain width, and at its ends two narrow regulation bands that restrict it or enlarge it in accordance with the width of the cloth being topped. A doctor that can be placed in position or taken off with the greatest ease scrapes off all coloring bath making its way on the regulation bands.

In all cases the cloth is passed over stave rails and a scrimp rail before being treated with the bath in the trough. The shaft of the lower pressure bowl is driven through special gearing, connected with an electric motor driving the whole plant, the speed of which can be regulated in accordance with the material being treated, the padding bath used, etc.

The plant is moved or stopped by hand levers, L, L, and there is a direct connection between the driving mechanism of padding machine and of the drying bowls. The double drying plant contains sixteen tinned iron or iron copper-plated bowls, placed on a light, high, iron framing, f, which also has at one side a plaiting mechanism for forming the dried material into pieces.

The machine is supplied with patent stands or doll heads, constructed to pack from the outside. These are furnished with all the necessary steam and condensed-water accessories, including steam valve, safety valve, pressure gauge and steam trap. The cylinders, unless demanded for high pressure, are usually made for a working pressure of 15-16 lbs. per square inch. No leaking or blowing should occur in properly constructed plants, bringing about the imperfect drying of the material.

Work on the Plant

Work on the above plant would be more or less as follows, when conducting the topping of cotton fabrics dyed in direct coloring matters: After threading a cotton tape, and causing it to pass on the series of cylinders A and B, the size of the surface to be colored is regulated in accordance with the width of the fabric being entered by moving the narrow endless bands at the ends of the large coloring band, and fixing them in the positions arranged. The topping bath that has been prepared in the required quantity in a small separate vessel at the back of the plant is then introduced in the trough of the padding machine with the assistance of a copper spoon, which nearly fills the trough. When this has been accomplished the cotton fabric to be topped is sewn to the end of the cotton tape indicated above, so as to avoid a useless elevation of the point of junction, and the plant is started.

The cotton cloth is thus passed between the nip of the padding machine, rising immediately afterwards and passing on the two spreading bars of rails F, to descend in contact with the first drying cylinder of the series A, and to pass from here continuously through the rest of the drying plant at a great speed, being finally distributed in dry folded form by plaiter P into a small iron wagon, ready for calendering and other finishing operations that may be required. The operators watch the material continually, smoothing it of any plaits that may be formed, reducing the steam consumption to just what is necessary for accomplish-

ing the drying. The tension on the fabric is regulated by turning small handles both before and between the two series of drying bowls.

The Advantages of the Plant

The above plant possesses several advantages, some of which can be indicated as follows:

1. The cotton cloth that has been dyed in the direct or substantive coloring matter can be topped completely on one or both of its sides, with one or two passages through the plant.

2. The topping on the one or two sides can be reduced to leave less bright portions towards the borders of the cloth through a careful arrangement of the position of the narrow endless bands.

3. If needs be, the cloth being topped can be entered completely in the bath of treatment, receiving in this way a thorough wetting, and a topping that penetrates evenly all through.

4. Owing to the large number of the drying drums these can be heated with low pressure steam or escape steam, strongly reducing the cost of the drying operations.

5. If the drying cylinders are more strongly heated, and the nature of the topping bath and fabric being treated allows it, the last can be run through the plant at a strong speed, increasing the production considerably, and reducing somewhat the cost of treatment.

6. The material, when topped only on one side, receives a certain squeezing and this causes a better penetration of the dye bath than is possible with the machine dindicated in Figure 2.

7. The dyed material can be entered rolled on beams of from piece form, an advantage not to be neglected, especially as the drying that has followed the dyeing with the direct color may have brought the material either on beams or in pieces.

8. The space occupied by the whole plant is quite small, considering the amount of work accomplished through its means.

9. The control of the plant is complete, and it can be stopped and worked at a moment's notice.

10. The possibility of regulating the speed at which the material runs through the plant, permits the regulation of all work in accordance with the class of goods that may to be treated from time to time; thus light fabrics can be topped much more rapidly that the heavier goods, and these not as slowly as very heavy goods.

Part XVIII will appear in an early issue

Plans have been made by the Yoakum Hosiery Mill Co., Yoakum, Texas, for the construction of a new plant, to cost $100,000, according to C. Mankin, president of the company. The machinery will include 50 knitting machines, 20 loopers, and dyeing equipment. The organization of this company was recently noted.

STANDARD SPECIFICATIONS FOR VARIOUS TEXTILES

The United States Bureau of Standards has issued Government Master Specifications for the following textile products: Bleached wide cotton sheeting; bleached cotton sheets (medium and high count sheetings); cotton waste, colored; brown denim, unshrunk; indigo blue denim, shrunk; mercerized cotton airplane cloth, Grade A. Each of the circulars giving the specifications describe the grade, material, general and detail requirements, inspection and tests, packing and marking and other information on each item.

NEW GERMAN DYE BASE ANNOUNCED

Considerable mystery surrounds the exact nature of a new "fluid" recently announced by Professor Duisburg, head of the German dye cartel.

The invention was perfected by Professor Berguis, of the University of Heidelberg, who, by dissolving coal through a process of hydration, obtained a certain oil from which may be derived many important chemical solvents. This oil and the derivatives are especially useful as engine fuel, as a dressing for textiles and also as a base for the manufacture of dyes.

A ton of coal, it is declared, can be made to yield half a ton of oil. Professor Bergius considers his process certain to revolutionize the world's organic chemical industries.

NEW DU PONT BLACK LEAVES CELANESE UNSTAINED

A new product manufactured especially for use in the dyeing of blacks on materials containing Celanese has been placed on the market by the Dyestuffs Department of E. I. du Pont de Nemours & Co. Heretofore difficulty has been experienced in obtaining a black that will leave Celanese unstained, and this new product, known as Pontamine Fast Black CW, is stated to surpass other direct blacks in this respect.

Pontamine Fast Black CW has good fastness in general for a direct color, the company's announcement states, but is especially satisfactory because of its good fastness to washing and perspiration for materials containing Celanese, particularly those products which are to be used for clothing.

It can be aftertreated with formaldehyde to improve fastness to washing, but this reddens the shade somewhat.

It is stated to be very soluble, and as copper and iron have very little effect on the shade it can be used in all metal dyeing machines. While its chief use is for deep blacks, it can also be used for padding light shades of gray. It dyes best with the addition of 20 per cent Glauber salt at a temperature of 160 deg. Fahr., and this method is generally employed to obtain the most satisfactory results when it is desired to leave Celanese unstained.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

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Managing Editor

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A LESSON IN RESEARCH FINANCE

AN item on another page reports the encouraging growth of the Research Fund being raised by the Silk Association of America. Details concerning this fund and the work for which it will be used appear in the August issue of the association's organ, "The Silk Worm," from which we quote:

> The Research Fund was first begun by the United States Testing Company in October, 1923, and continued until March, 1924, when the subscriptions totaled about $11,500. Since November of last year, when the subscription work was resumed, the total has reached $17,000. As the scope of the research work ahead broadened, and the effort required in the undertaking was realized, it was thought best for the Silk Association to take over all control of the operation of the fund. These are the circumstances under which renewed effort will be made at once to reach the minimum goal of $30,000.
>
> The working basis on which it has been determined to solicit subscriptions is $1.00 per loom for broad silk manufacturers; 1½ cents per spindle for throwsters; although this is merely a suggested basis for equitable apportionment of the fund.
>
> It is intended that the fund when completed shall be spent over a period of three years in researching.

According to the item referred to above, the $20,000 mark was reached a few days ago. The response to the call for funds indicates not only that men in the silk industry are alive to the need for such a research program as that planned by the association, but also that they fully realize that only when all have contributed their share can the work be accomplished.

The silk industry seems somehow to have grasped the textile research problem in its entirety, in its broader aspects. They see leaders in the textile industry talking ambitiously of organizing an extensive research institution, scientifically ramified and departmentized with a bewildering army of committees and subcommittees on this and that phase of textile manufacture. But they also see that the silk industry need not sit by and wait until this great textile research project is well under way. They evidently have thought about this for a long time and the conclusions which they reached are now being revealed in their response to the call for funds. They intend to go ahead with part of this research work, as an independent industry, as a unit of the textile industry. They have mapped out their own research program and have organized their own committees, and when they have the money they can start their own research operations without further delay.

Then, they must surely realize, by the time that the bigger research machine is ready to begin its work—that which will embrace the entire textile industry, cotton, wool, silk and rayon—that which is being discussed by representatives of each of these branches—by that time this smaller unit, the silk industry's own research organization, will be solidly established and in perfect condition to join forces with the larger body if it so desires.

Try to realize, for a moment, the amount of research work that will have been accomplished by this active little unit in the meantime, while the "big show" was getting under way; think for a moment of the problems that will have been labeled "solved," of the standards and the tests and the results that will have been established and recorded in black and white. And then be convinced, now and for all time, of the tremendous, unrealized possibilities that lie in a research fund adequately subscribed to. Be convinced of what can be accomplished in textile research by wholehearted, intelligent *co-operation*. The lesson is an excellent one when viewed in the light of recent calls for funds for research in textile chemistry and dyeing.

"MORE CHEMISTRY THAN LAW IN BUSINESS"

THE following editorial recently appeared under the above caption in a little publication, entitled "Business Chemistry," issued by Skinner, Sherman & Esselen, Inc. It is so concise, clear and sensible that it needs little comment. As its title implies, it is an argument for a more practical, more scientific business organization, through the elevation of the chemist to the position which he logically should hold in business. Boards of directors, in other words, usually conform to a traditional, stereotyped pattern rather than to the practical necessities of modern business.

> A Boston business man remarked recently that the ideal board of directors for an industrial concern would include a banker, a lawyer, a production man and a chemist, in addition to the president of the company.
>
> This idea is not new, for we have touched upon

it before in Business Chemistry. But this man brought out a point we have never heard expressed before: that it is common practice for a company to have a lawyer on its board of directors, but why a lawyer any more than a chemist? "Does not almost any manufacturing enterprise involve as much, and generally more, chemistry than law?" he asks. "And is not chemistry likely to play a more important part in making profits for the company?"

Certainly we know of no argument against this contention. As a rule chemistry does have a decided influence on profits, and as a member of the board the modern business chemist should be able to contribute much to the successful direction of any business, not only in matters of current operation and control but in planning for future development and profits through his understanding of the advances science is making in industrial processes and the profitable utilization of by-products.

BRITISH GOVERNMENT TO SELL INTEREST IN B. D. C.

A news report appeared on August 21 announcing that the British Government is preparing to dispose of its interest in the British Dyestuff Corporation to a financial syndicate that will undertake to pool the shares until after the capital reorganization has been completed.

It was stated that the stock of the corporation at present held by the British Government consists of 850,000 preference shares and 850,000 preferred shares all valued at £1 each. The preference issue is quoted at approximately 10s. and the referred at 4s.

No definite reason is assigned for this transaction. It is pointed out that when the sale has been effected the British Government will have practically severed financial relations with the Dyestuff Corporation and that its heretofore paternal interest in the enterprise may be lessened accordingly.

"Maintaining Interest in Safety" is the subject of a pamphlet just issued by the National Safety Council which points out that to start an accident prevention campaign is one task, but to maintain it in spirit requires enthusiastic effort. It is after the band stops playing and the parade is over that deep thought must be given the subject.

Every manufacturer, public utility concern and corporation should be interested in this new piece of literature, says W. Dean Keefer, chief engineer of the industrial division of the National Safety Council, who will be glad to send a copy of the leaflet free of charge to anyone who writes him at 168 North Michigan Avenue, Chicago, Ill.

The booklet is illustrated with photographs, charts, etc. One item alone that is well worth reading is that part which tells of the intervals between the inspections of various items, some of which should be examined daily, others every six months and several only once a year.

A. A. T. C. C. MEMBERS PLEASE NOTE

The American Association of Textile Chemists and Colorists will co-operate with the Dinner Committee in charge of the Fourth Annual Chemical Industries Dinner to be held at the Hotel Roosevelt on October 1st.

Secretary Hadley has arranged with the Committee to have invitations mailed to all members of the New York Section of the Association and desires through this notice to extend the same invitation to members of other local sections who intend to visit the Chemical Exposition. The charge for the dinner has been fixed at $5.00 per head.

To date seventeen prominent chemical associations have arranged to be represented at this dinner. There is no question but that it will be one of the notable events of the year in the chemical industry and every member of the A. A. T. C. C. who expects to be in New York on October 1st should make an effort to join their fellow members at the dinner.

SILK RESEARCH FUND GROWS

Two-thirds of the Research Fund being raised by the Silk Association of America has already been subscribed through its members. The $20,000 mark in the campaign was reached recently, while the miniumum sum necessary to undertake the work is place at $30,000.

Co-operation among the silk men alone has made this rapid progress of the fund possible, and it is expected confidently that pledges covering the remaining $10,000 will be in the hands of the executive committee of the Association in the near future.

When the fund is completed, it will be operated to conduct researches on problems pertaining to every branch of the silk industry. The leading question among silk men to-day, which will probably be one of the first subjects undertaken, is that of raw silk classification.

Methods of testing raw silk for size, winding, tenacity, elasticity, elongation and definition of defects, as developed by the Raw Silk Classification Committee, are waiting completion. This work has been brought to a point where scientific assistance and equipment are essential for its completion. In a letter which the committee addressed to George A. Post, resident of the Association, they reported their progress since the reorganization meeting of last October, and added that it would be impossible to continue their work on testing methods with the voluntary services available up to the present through members of the committee.

After the perfection of standards, other questions which may come under the industrial reasearch are dyeing, weighting, soaking and manufacturing processes.

PRELIMINARY STAGES IN WOOL DYEING

(*Continued from page* 584)

3. Half scoured wools, i. e., such wools as are already partly scoured by soaking in water as above described; also Colonial wools which have been subjected to preparatory scouring in the country of production.

4. Dead wools (fleece wools) and skin wools, which are stained in tanneries as a by-product in liming skins.

For the last named skin wools a preparatory treatment with tepid muriatic acid of 1½ deg. Tw., and subsequent thorough washing in water is most desirable in order to remove the greater part of the lime which is left in the wools. If the preparatory process is omitted, and the skin wools are brought direct into the scouring baths, a greater part of the lime is not only left loosely adhering to the wool, but it is even precipitated into the wool fiber, as carbonate of lime by the soda, and this leads in the later dyeing operations to difficulties, especially to uneven and dull shades.

Experience has shown that dirty wools are more easily and quickly scoured after being stored for several months in places protected from dampness. Probably the oxygen in the atmosphere produces a kind of oxidation of the grease during storage, which renders it more easily soluble. Such oxidation may, in damp wools, cause a considerable generation of heat, and even lead to self-combustion. In case the wool is scoured by one of the so-called dry scouring processes, which will be mentioned later, it is first treated in a shaking machine in order to remove sandy substances.

Scouring Lyes

As a rule, however, the wool is entered direct into the scouring cistern, especially in wet scouring, and only very cheap and dirty wools are previously soaked for several hours in cold water, in order to soften the dirty and earthy impurities.

According to the degree of purity of the wool, the scouring lyes are made up more or less concentrated. In most cases soda lye 1½ deg. to 3 deg. Tw. are used. The temperature should, generally, not exceed 122 deg. Fahr., as at a higher temperature, especially when soda lye is used, the wool turns yellow and becomes brittle. Greasy wools can be scoured at 122 deg. to 131 deg. Fahr., whereas half scoured wools must not be treated at a higher temperature than 104 deg. to 113 deg. Fahr.

The scouring and subsequent rinsing are almost always carried out in specially constructed machines, which consist of several shallow becks in which the wool is continually moved along by mechanical agitators, rakes, or forks, in such a way that in being carried from one cistern to another it passes between powerful squeezing rollers. These machines do away with the antiquated manipulation by hand, which is more costly and causes the wool to become entangled and felted, apart from the fact that the greasy Colonial wools which are so largely used at present cannot be scoured properly by one manipulation but require several passages and continuous treatment.

Experience shows that wool scoured in a newly prepared soda lye is never quite clean and only the third or fourth lot that has been treated in the same lye become clean. Consequently in small dyeworks where only one scouring machine is at the disposal of the dyer, the method of practical working generally is that in fresh lyes just a few half scoured lots, and afterwards ordinary greasy wools are scoured, or that the scoured or fresh lyes are put back for a repeated scouring. For this reason the scouring lyes are used as long as possible.

Used Lyes

For large establishments the favorable effect which previously used scouring lyes have or fresh lots are utilized by placing three or four cisterns behind one another, and carrying out the scouring in such a manner that the greasy wools are first entered into the vat which contains the oldest scouring lye. From this, after being squeezed out, they pass into the next cistern containing cleaner scouring liquid, and finally they are rinsed in the last compartment. When the lye in the first cistern has become too dirty this compartment is emptied, the lye from the second vessel pumped into it, and so on from the following into the previous ones. By adding stronger lye the concentration of the liquid is kept up to 2 deg. to 3 deg. Tw.

After scouring in the alkaline bath a thorough rinsing in clean water is necessary in order to remove all the alkali from the wool and to extract any trace of wool grease still adhering to the wool.

The softer the water the cleaner will be the wool after rinsing, for the lime in hard water combines with the soap-like compounds contained in the wool to form lime soap which, when precipitated upon the wool fiber, make it sticky, yield a bad handle, and produce an unevenness in dyeing, spinning and milling. Where no soft water is procurable it is advisable to soften and purify it, the improvement thus brought will invariably pay for the necessary outlay for the purifying plant.

The results obtained in rinsing are the better the colder the water is. This is due to the fact that in cold water lanoline and the lime soap which may be formed harden and become brittle, in which state they detach themselves more easily from the fiber, whereas in warm water they are dissolved, become sticky, and by enveloping the wool fiber as thin films impart a dull appearance to the scoured wool.

Use of Alkalies

Favorable as are the results in scouring greasy wool by means of alkalies, especially soda, the employment of warm alkaline soda lyes in unskilled hands is fraught with considerable risk to the wool fiber which is extremely sensitive to alkalies. As it is impossible considering the varying degrees of purity of the wool, to prescribe

definite quantities of alkali, the determination of the strength must be left to experience.

Even the last and most experienced wool scourer will occasionally meet with wools which he gauges wrongly as to their degree of purity. Any faults resulting from too low a temperature of the bath, or from using too little alkali, become apparent only in the latter stages. Likewise, through too high a temperature or too large a quantity of alkali, the further treatment of the wool and final results can be impaired. The wool turns yellow and presents difficulties in spinning; it also loses its capacity for milling, etc.

Organic Solvents

While the employment of organic solvents seemed to be out of the question until quite recently on account of its high price, the first experiments with volatile solvents proved abortive owing to their extreme flammability. This is even enhanced in scouring, for dry wool fibers show certain electrical phenomena which, if oxygen is present, cause discharges and explosion of the gases.

It is only by a method much improved in the last decade that wool scouring by means of volatile solvents has been permanently introduced into the industry. This method, initiated by Emile Maertens and patented in many countries, was first practically adopted on a large scale in the Arlington Mills, Mass., and is now also followed in many wool scouring establishments on the Continent.

The essential feature of this method is to avert the danger of explosion of the gases by preventing their contact with the oxygen of the atmosphere. The wool to be scoured is put into hermetically closed cylinders from which, after they are filled and closed, all the air is forced by some inactive gas—generally by carbonic acid. By means of the latter the benzine to be used as solvent is then pressed into and through the reservoirs which are arranged one behind another. Here, also, the treatment follows the principle of counter-current, i. e., each reservoir is treated several times with solutions of ever-increasing purity. The purification having been accomplished the remaining traces of benzine liquid or gas are removed by a warm stream of carbonic acid before reservoirs are opened.

Thus the combustible benzine is throughout the whole of the process prevented from coming in contact or admixture with air or oxygen. The fatty solutions of benzine are then treated with wool grease, which, as degras and lanoline, is a commercial commodity of some importance. The wool, when freed from grease is soaked in water and washed without any addition in order to remove the soluble substances.

Some Disadvantages

It is obvious that the above described method necessitates an extensive plant, and can therefore only be carried out to advantage on a large scale. The greatly increased cost of production compared with the web scouring process will be compensated by better quality of the wool, greater pliability in spinning, and a better yield of by-products.

The chief disadvantage of the method was, until recently, that in order to carry out the scouring process properly the wool had to be in a perfectly dry state, a condition which is most difficult and costly to fulfil. But if the wool was not dry the benzine did not sufficiently penetrate it, and the scouring was incomplete. Moreover, the solutions of grease were opaque and their further treatment difficult.

This defect is said to be overcome by another (likewise patented) process of the same inventor. Its essential feature consists of heating the greasy wool before scouring with unsaturated aqueous solutions of salts and acids. The fatty solutions of benzine therefore remain clear. Moreover, it is possible to remove in operation the potassium salts present in the wool by a treatment with soap solutions.

In another process the inflammable hydrocarbons are replaced by the non-explosive and non-flammable carbon tetrachloride. If it be possible to produce this chemical solvent cheaply enough for general application this process will undoubtedly be taken up very extensively.

Another recent original process which has been introduced into practice might be mentioned. It is a patented process in which the greasy wool is passed through a "devil" while being treated with a current of air charged with finely divided solid substances, capable of absorbing grease—such as gravel, earth, kaolin, etc. Their minute division produces a very even removal of the grease, after which the soluble potash soaps are washed out.

Doubtless the newer processes possess advantages which favor their adoption and are likely still to further promote their introduction, provided that the cost of installation and working can be reduced. At all events it is imperative to give every possible attention to the scouring of wool as the first and most important preparatory operation. Good scouring is of the greatest importance, not only for dyeing but also for spinning and weaving. A well scoured wool should be open and lofty, and a yellow color. It should also be free from sticky matter and felted fibers.

Faulty Scouring

Badly scoured wools not only yield bad results in spinning and produce goods with a disagreeable sticky handle (which defect is even intensified through the subsequent finishing operations) but also occasion unpleasantness in dyeing and milling, because the still adhering wool grease prevents a good penetration and fixation of the mordants and dyestuffs. This disadvantage often shows itself in a greater consumption of mordants and dyestuff than is actually required, and, furthermore, in milling, dark shades often bleed into accompanying lighter ones. As the colors are only superficially fixed on badly

scoured wools, they are easily removed and yield thoroughly uneven effects, especially in piece dyed goods. The dyer is not infrequently held responsible for such faults, and the damage arising therefrom, whereas their origin lies simply in the bad scouring of the wool, which is mostly outside his control.

Sometimes half-scoured wools are dyed for cheap goods, especially for blacks. For other colors, however, the employment of these wools is permissible in very rare cases.

Carbonizing

The next preparatory operation to which loose wool is frequently subjected after scouring is that of carbonization. The object of carbonization is to remove the impurities of an organic nature adhering to the wool, such as burrs, straw and other vegetable remains which have lodged themselves in the fleeces from the sacks in which the wool has been packed.

All such vegetable impurities are impediments in the future manipulation of the wool—in dyeing, by preventing a sufficient absorption of the dyestuffs—so that the goods when finished have an unsound appearance. For that reason their removal becomes necessary.

It is accomplished by carbonization which is carried out in two ways. Either the woven goods, before or after dyeing, are treated for the removal of vegetable impurities, or, as is largely done, the wool is carbonized in its loose state.

The carbonizing process is based on the fact that vegetable matter is rendered tender or destroyed by acid or acid salts at a high temperature due to the withdrawal of water. In the same circumstances the wool fiber undergoes no perceptible change.

As a carbonizing agent sulphuric acid is mostly used. For that purpose the wool is immersed for a quarter of an hour to half an hour in sulphuric acid of 4 deg. to 6 deg. Tw., then hydroextracted and dried in specially contsructed ovens (the carbonizing stoves) in which it is left for an hour to two hours at 158 deg. to 212 deg. Fahr., according to the concentration of the acid and the construction of the stoves. Through the evaporation of the water the acid becomes more and more concentrated, and this destroys the vegetable fibers. The wool is then shaken, and thus the loose carbonized vegetable substances—also mineral substances and mineral admixtures—are pulverized and removed. Finally, it is thoroughly rinsed in order to remove the sulphuric acid still present in the goods. Generally, rinsing in water suffices, but if the acids are too firmly fixed the goods have to be neutralized by a cold soda bath 1½ deg. to 3 deg. Tw.

Instead of sulphuric acid hydrochloric acid may be used and also salts that split off acid at a high temperature, e. g., aluminum chloride, magnesium chloride and sodium bisulphate (tartar substitute).

Hydrochloric acid, which has a milder reaction than sulphuric acid, is principally used for carbonizing shoddy. It is mostly applied in the form of hydrochloric acid gas, which is passed into specially constructed drums containing the rags.

Aluminum chloride and magnesium chloride have also a milder reaction than sulphuric acid, and in order to produce the same effects must be used at a higher concentration. (12 deg. to 18 deg. Tw.) and at a higher temperature. For the former the temperature is raised to 212 deg. to 230 deg. Fahr., for the latter 239 deg. Fahr. As these two substances affect the dyestuffs less strongly than sulphuric acid, they are preferred—especially aluminum chloride—for carbonizing dyed piece goods and multicolored mixture wools, while they are rarely employed for loose white wools.

For the latter sodium bisulphate is largely used. This has the advantage over sulphuric acid and that is safer and cheaper although its reaction is less energetic. The carbonizing liquid must be kept up to 11 deg. to 12 deg. Tw., and in order to effect a thorough penetration of the vegetable matter it is advisable to leave the material rather longer—three quarters of an hour—in the bath before hydro-extracting it and taking it into the carbonizing stove.

Temperature and Concentration

The temperature in the latter must be kept at about 212 deg. Fahr., but it may be lowered if the time for carbonizing is prolonged. In rinsing and neutralizing, wool carbonized with sulphuric acid, in most cases rinsing with water is sufficient.

At all events the whole operation has to be most carefully conducted by regulating the concentration of the acid baths, the duration of the carbonization, and the temperature in such a manner that the carbonized vegetable substances are easily and surely removed when shaken. Too strong a carbonization, whether produced by too high a temperature or by too strong acid baths, has an injurious effect on the wool fiber and renders it brittle. Moreover, it often causes uneven shades by leaving the tips of the wool lighter.

It is important for a good result of the carbonizing process that only thoroughly scoured and well-rinsed wool be employed for carbonizing. If the wool still contains remains of soaps or lime soaps, the sulphuric acid liberates fatty acids during the carbonization which, owing to the high temperature, adhere firmly as sticky grease to the wool and lead to many defects in the subsequent dyeing, spinning and milling.

More unpleasant still are the consequences of the presence of greasy and soapy substances in bady scoured wools if magnesium chloride or aluminum chloride has been used. By their relation the magnesium and aluminum salts of the fatty acids are fumed, which are decomposed by carbonization, and burnt into the wool from which they cannot be removed.

Another point of importance is that the wool be well and evenly immersed in the acid, that it be equally and

evenly hydroextracted, and finally brought into the carbonizing stove as quickly as possible. On no account must the liquid be allowed to dry partially upon the wool or the soap goods be exposed to much sunlight, for in the dried places, or those exposed to the sun, a stronger reaction of the sulphuric acid takes place, which later on becomes apparent in deying in the form of spots or streaks. —*The Dyer and Calico Printer.*

Dyestuff Tables

A List of the Principal American-Made Colors with Their Properties and Fastness Characteristics

[NOTE: The publishers of The REPORTER have secured more or less complete data in regard to many of the dyestuffs which are at the present time being manufactured in the United States. As the following material has been brought together from various sources, they realize that errors are quite likely to appear, and it is earnestly requested that any readers who find errors or who are able to give additional information will communicate with the publishers in order that this material may be made as correct, complete and up to date as possible. These tables will appear serially until all colors upon which we have data shall have been covered. The publication of this data was begun in the issue of March 10, 1924.]

CORRECTIONS

The REPORTER has received two letters calling attention to important errors in the last installment of Dyestuff Tables, which appeared on pages 572 and 573 of the August 24 issue.

The first, from the Peerless Color Company, points out corrections in the published description of the properties of Primuline and Chloramine Yellow, as follows:

"Primuline: This is a Thiobenzyl dye and is not related at all to Quinoline. It is especially suited for cotton and silk, both natural and artificial. The natural silk trade also uses a very large tonnage of it. Method of dyeing: The usual method is used no matter whether for red or not. Shade: It dyes a very greenish yellow. Fastness of direct dyeings: Direct dyeings of Primuline are not used at all. The shade changes even in the dark. It is brilliant greenish yellow at first, with a good Primuline, but loses its fire very quickly.

"The most serious error occurs in 'Dyed by Other Methods.' Primuline for yellows is usually developed with chloride of lime at ¾ deg. Tw. and is *not* afterwards diazotized as you state. It should be entered in the cold bath and worked for some hours. Then the bath should be heated. This results in a yellow which is faster to everything than any known yellow, not even excepting vats. (See REPORTER, December 31, 1923, page 941: 'Dyeing of Olive Drab,' Claflin; March 10, 1924, pages 160 to 163: 'Primuline and Vat Colors for the Production of Fast Khaki Shades,' Unterwiser.) The yellow produced is a golden yellow, not orange.

"When Primuline is developed with metaphenylenediamine, the shade is a brownish red or terra cotta, not claret, but three ounces for five pounds of color would not be enough. I should use at least three pounds. Developed with phenol, yellow; with resorcin, orange. Alpha naphthol gives a maroon, not a scarlet. It is not very good.

"Neither Primuline nor any of its developed products would discharge properly and should not be so used.

"Regarding Chloramine Yellow, Schultz No. 617, we advise common salt rather than Glauber salt. Neutral or faintly alkaline bath for cotton or artificial silk. Neutral or acid for any other fibers.

"Shade: I would take exception to your statement that it gives 'dull yellow, somewhat thin.' Please note enclosed sample.

"Fastness: Pale shades will stand boiling to some extent, and I think you will find, if properly worked, cross-dyeing can be done.

"Light: This yellow is *much superior* to Direct Yellow R, Schultz No. 9.

"Chloramine yellows are not dischargeable at all, either with tin or zinc, and are not affected by bleaching. Towel headings can be dyed in the gray yarn and a finished towel bleached. The only effect on the yellow is to brighten it, which is due to bleaching the underlying fiber and not to any change in the yellow itself."

The second letter, from American Aniline Products, Inc., corrects the statement made under New Blue, manufactured by this firm under the name of Naphthol Blue 3R. The letter reads in part: "We note that you state that for leather this product is unsuitable, and we write to correct your statement . . . This is one of the most important uses for this product, of which we are large manufacturers."

A third correction, from the National Aniline & Chemical Company, states that their Erie Violet 3R, listed as a prototype of Acid Violet 4BN on page 445 of the June 29 issue of The REPORTER, is a *direct* color, and hence cannot be classified with Acid Violet 4BN. The prototype of the latter should have been listed as Acid Violet 4BX, made by the Calco Chemical Company.

The publishers desire to acknowledge these valuable corrections with thanks and appreciation. They are encouraged to note that their request for corrections of these tables occasionally meets with some response, and trust that readers who can supply additional data of this nature will not hesitate to do so.

METHYLENE BLUE

(Schultz No. 659)

COMPOSITION: Oxazine.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: On a tannin mordant.

SHADE BY CASLIGHT: Greener.

FASTNESS TO:

Acid: Fast.
Alkali: Fairly good.
Chlorine: Almost fast.
Ironing: Fast.
Light: Best of the basic blues; fourteen days almost no change.
Rubbing: Fast.
Washing: Fair; better when steamed and topped with tannin.

OTHER PROPERTIES: Used as a catalytic agent in discharging Alphanaphthylamine.

ON OTHER MATERIALS: Wool: No interest. Silk: Boiled-off liquor and acetic; fast to alkalies, acids and fairly fast to light.

PRINTING: Cotton on silk with tannin.

DISCHARGING: Used as a color discharge for Alphanaphthylamine Claret.

COMPETING PRODUCTS: Made in the United States by Holland Aniline Company, under name of Methylene Blue; Calco Chemical Company, under names of Methylene Blue 2B and 2BC and Methylene Blue Zinc Free; American Aniline Products, Inc., under name of Methylene Blue 2B; Sherwin-Williams Company, under name of Methylene Blue 2B; National Aniline & Chemical Company, under names of Mehylene Blue 2B and SP; Williamsburg Chemical Company, under names of Methylene Blue 2B Conc. and Methylene Blue Zinc Free and U. S. P.; E. I. du Pont de Nemours & Co., under names of Methylene Blue BX, Z and ZX; Newport Chemical Company, under name of Methylene Blue Extra.

METHYLENE GREEN B

(Schultz No. 660)

COMPOSITION: Oxazine.

SPECIALLY SUITABLE FOR: Cotton printing and silk dyeing.

USUAL METHOD OF DYEING: On cotton: Tannin mordant and add alum or acetic acid to dye bath.

SHADE: Greenish blue.

SOLUBILITY: Good.

LEVEL: Dyes level.

FASTNESS TO:

Acid: Good.
Alkali: Fast.
Chlorine: Moderate.
Cross-Dyeing: Moderate.
Ironing: Fast.
Light: Same as Methylene Blue.
Rubbing: Fast.
Washing: Moderate; same as Methylene Blue.
Water: Fairly good.

ON OTHER MATERIALS: Silk: Used mostly for toning logwood blacks; forms a soap liquor but dyes well on tin weighted or unweighted silk; fast to rubbing, washing and water; fair to light; improved fastness by topping wih tannin. Wool: No interest.

PRINTING: Cotton on tannin.

DISCHARGING: Good for tannin discharges; suitable for color discharges with tin crystals. Rongalite, alkaline or oxidation discharges: No interest.

COMPETING PRODUCTS: Made in the United States by National Aniline & Chemical Company.

BRILLIANT ALIZARINE BLUE

(Schultz No. 667)

COMPOSITION: Oxazine.

SPECIALLY SUITABLE FOR: Wool and vigoureux printing and cotton printing.

USUAL METHOD OF DYEING: On wool: With Glauber salt and acetic acid and fluoride of chrome or chrome mordant. On cotton: Printed with acetate of chrome.

SHADE: Dull navy blue, dyed chrome bottom.

SHADE BY GASLIGHT: No change.

SOLUBILITY: Fair.

LEVEL: Very sensitive to acid.

EXHAUSTS: Not clear.

FASTNESS TO:

Acid: Turns redder.
Alkali: A little greener.
Carbonizing: Moderate.
Cross-Dyeing: Moderate.
Fulling: Against normal fulling, good. White wool and cotton stained in strong fulling.
Ironing: Fast.
Potting: Poor.
Steaming: Goes darker when steamed one hour at 16 pounds' pressure.
Sulphur: Fast.
Washing: Very good.

SENSITIVE TO METALS, LIME: Very sensitive to acid and after-treated with bichromate the color is destroyed. After-treated with fluoride of chrome, becomes brighter and greener but weaker. Also sensitive to copper. The chrome bottom shades are dull.

ON UNIONS: Cotton-effect threads are stained.

ON OTHER MATERIALS: No interest.

PRINTING: Principally adapted for vigoureux printing with acetate of chrome. Excellent for cotton printing with acetate of chrome.

(*Continued on page* 610)

Technical Notes from Foreign Sources

Bright Green with Dinitrosoresorcinol

Up to the present time it has not been possible to obtain a fine green shade with the aid of nitrosoresorcinol, which when used for dyeing on an Aniline Black ground will give a shade of equal luster as the black. The following process, which is described in Der Textile Chemiker und Colorist, 1925, pages 89-90, accomplishes this result.

The cloth is given a slop-padding in a hot chamber with a solution which contains the following ingredients: 132 grams of resorcinol, which is nitrated in the usual manner, are treated with 264 c.c. of hydrochloric acid, 168 grams of sodium nitrite and the necessary amount of ice water. After the diazotization there are then added 1,000 c.c. of ammonia and 1,250 grams of potassium ferricyanide, as well as the required quantity of water. The solution is then made up to the volume of 10 liters.

The resist paste used in the printing process is made from the lake color and albumen, and there is also used a solution of 45 deg. Be. potassium sulphite, 200 to 250 c.c. being used for every kilogram of the printing paste. The paste contains as well a small amount of sodium citrate.

After the cloth has been passed through a small Mather-Platt machine, it is washed in lukewarm water and then in cold water. Then the cloth is passed through a cold bath which contains 8 c.c. of hydrochloric acid per liter, and thereafter it is washed and dried.

The purpose of the acid treatment is to form a certain proportion of Berlin Blue, which has the effect of brightening up the color tone to a marked degree, and the result is that the olive green usually obtained is converted into a brilliant green. The olive tone, moreover, depends on the amount of potassium ferricyanide which is found in the slop-padding liquor. When only a little of the potassium ferricyanide is present, then a brownish olive green is obtained, and as the percentage of ferricyanide rises an increasingly brilliant green is obtained.

There are two means which may be employed in toning the green: the one just discussed—that is, potassium ferricyanide—and the second, acidification or sour treatment. When there are 125 grams of ferricyanide in the liquor, the action of the salt is at its best. On the other hand, from 5 to 10 c.c. of hydrochloric acid per liter are sufficient to change the olive green into a bright green.

All the different green and olive green colors, except those that have been acidified, may be printed with white or color resist designs with the aid of potassium sulphite.

It may be said that the light resistance of the green secured in this manner may not be very satisfactory. For it is known that the light resistance of Berlin Blue is little, while that of the Fast Solid Green obtained from dinitrosoresorcinol is considerable. Therefore, the fastness of the bright green obtained in this manner will depend on the percentage of Berlin Blue that is contained in it.

Importance of Enzymes and Ferments in the Textile Industry

It is a fact that the fermentation process has been used by mankind as far back as history extends to aid in the making of various products which have been used as food and drink for the ages. The use of enzymes in the textile industry is an important application of the fermentation process. The enzymes are, as is well known, catalytic substances, and have a selective action. When heated to a temperature of 100 deg. Cent., the potency of the ferments is destroyed. The addition of certain chemical reagent, organic solvents and metallic salts, as well as the use of high pressure, causes the enzymes to lose considerable effectiveness. On the other hand, there are certain chemicals which by their very presence tend to increase the activity of the enzymatic substances.

Biolatalytic processes have been used for a long time in the textile industry. For example, there is the retting of hemp, flax and jute, in which the decomposition of the various impurities that are intermingled with the fibers is accomplished by means of enzymes which are introduced into the fibers by means of bacterial action. Enzymes also exert their action in the obtaining of natural dyestuffs, such as Indigo. Then, again, there is the fermentation vat in which Indigo is dyed on fabrics, which is also an enzymatic process.

One particularly important use of enzymes is in the preparation of starch-solubilizing masses for the purpose of removing sizing from fibers. Any number of such preparations are on the market. (Mitteilungen uber Textilindustrie, 1925, page 202.)

Destruction of Wool on Exposure to Atmosphere

Scoured wool, which has a pH number of 8 to 8.5, is exposed to the air but protected from light. The exposure lasts for a period of two months, and at the end of that time the wool had become acid in reaction, being found to possess a pH number of 5 to 6. It was also seen that the wool had suffered visible surface damage; that is, the damage was noticeable under the microscope. The subsequent loss on scouring and bleaching was very high. The wool was found to be infected with a number of bacilli. Some of these ba-

cilli possess the power of liquefying gelatine and cause extensive damage to wool, destroying the epithelial scales and ultimately the entire fiber, when the fabric is present in a nutrient broth culture of the organisms. The action depends on the "reaction" of the solution. It was also found that the chief cause of bacterial damage was damp storage. (Jour. Soc. Dyers and Col., 1925, pages 121-127.)

Dyeing Animal and Vegetable Fibers

Vegetable and animal fibers are dyed in various shades by treatment with phenols or amines or their salts, together with one or more metallic salts; for example, the salts of copper, nickel, cobalt, iron or vanadium, or oxides and a persulphate, the resulting shade being dependent on the metallic salt employed.

Polychromatic effects on fabric dyed with a ground color by the above process are obtained by printing it with a paste that contains suitable metallic oxides or salts. Suitable phenols and amines comprise phenol, resorcinol, pyrocatechol, tannin, quinol, pyrogallol, aniline, meta- and para-phenylenediamine, diaminophenol, para-aminophenol, alpha- and beta-naphthylamine and benzidine.

For example, a fabric is dyed in chestnut and flaxen shades by immersion in a cold bath which contains 20 liters of water, 20 grams of meta-phenylenediamine hydrochloride, 20 to 40 grams of sodium persulphate and 0.8 to 1.6 grams of copper sulphate. Brown shades are obtained by dyeing the fabric by immersion in a hot or cold bath containing 20 liters of water, 50 to 100 grams of quinol, 20 to 40 grams of sodium persulphate and 0.5 to 1.6 grams of copper sulphate, and sufficient ammonia to redissolve any precipitated copper hydroxide. (British Patent No. 231,209.)

Insoluble and Unchangeable Hydrosulphite for Discharge

A process is described which has for its purpose the preparation of an insoluble and unchangeable zinc sulphoxylate which consists in treating sodium-bisulphite-formaldehyde with zinc dust and concentrated sulphuric acid of 66 deg. Be. The product was obtained by converting the bisulphite quantitatively into the hydrosulphite with the aid of zinc and sulphuric acid, after the bisulphite has first been converted into the form of formaldehyde-bisulphite. This was done for the purpose of avoiding the action of zinc or acid on this salt. The product that was obtained in this manner was a grayish white powder which can be used in the discharge process of calico printing with very good results.

Attention is also called to German Patent No. 165,280, in which there is described the formation of stable double compounds with hydrosulphurous acid which are obtained by the treatment of derivatives of bisulphites and saturated aldehydes with zinc dust and bisulphite or zinc dust and acids. (Der Textilchemiker und Colorist, 1925, page 90.)

Determination of Insoluble Azo Colors on the Fiber

In the introduction mention is made of the processes which have been known up to the present time for the analytical determination of azo coloring matters by means of reduction with the aid of tin chloride, hydrosulphite and titanium chloride, as well as the action of nitric acid whereby the diazo components of the coloring matter are obtained as nitrates and the azo components as nitro compounds. Further oxidizing agents which can also be used for this purpose are chromic acid permanganate, bromine water and hypochlorous acid.

A new method has been found which consists in the fact that the melting point of the arylaminoazo-2-naphthol is very much different from that of the arylaminoazo-2-naphtholic acid anilide. Which of the two compounds is present can be determined by crystallization and testing of the solution in concentrated sulphuric acid. A table has accordingly been worked out in which the melting points of known combinations with beta-naphthol and Naphthol AS, BOC, BO, etc., are contained. Hence all that is necessary is to compare the found melting point with those in the table in order to detect the dyestuff that has been used in the dyeing of the fabric.

The testing of the extracted coloring matter is also a very simple matter. Acetone is better suited as an extracting agent than toluene. Where the former solvent cannot be used, the sample must be entirely dissolved in cold concentrated sulphuric acid and the color depth developed by means of ice water. If the coloring matter under examination is composed of a number of components, then the diazo-compound is determined by conversion into the nitrate with the aid of cold fuming nitric acid, and a new combination made partly with beta-naphthol and partly with Naphthol AS, and the melting point is again determined. (Leipzig Monatschrift, 1925, page 21.)

DU PONT PRODUCES NEW TEXTILE CHEMICAL

E. I. du Pont de Nemours & Co., Inc., have recently put on the market a product known as Sitol, which is to be used in small quantities in the kier boiling liquor when white goods containing colored effects dyed with vat colors of the anthraquinone series are bleached, to prevent the bleeding of the vat colors into the adjacent white.

The vat colors are at times reduced under the combined action of the heat and the alkaline liquors, and the color is stripped from the cotton during the operation. A similar condition occurs at times if the goods are boiled in the open and piled in boxes while still impregnated with the washing solution.

Sitol can also be used to great advantage as an addition to resist pastes to be used under vat dyeing as it materially improves the resist effect.

DYESTUFF TABLES

(*Continued from page 607*)

DISCHARGING: On a discharged chrome mordant a good white is obtained.

COMPETING PRODUCTS: Made in the United States by Grasselli Dyestuff Corporation, under name of Brilliant Alizarine Blue GA; Garfield Aniline Works, under name of Brilliant Alizarine Blue GM.

AZO CARMINE GX

(Schultz No. 672)

COMPOSITION: Azine.

SPECIALLY SUITABLE FOR: Wool.

USUAL METHOD OF DYEING: Glauber salt and sulphuric acid.

SHADE: Bluish red.

LEVEL: Excellent.

FASTNESS TO:
Acid: Fast.
Carbonizing: Fast.
Fulling: Better than most of the acid reds.
Ironing: Fair.
Light: Moderate.
Perspiration: Fast.
Steaming: Fast.
Street Dirt: Fast.
Sulphur: Fast.

DYED BY OTHER METHODS: Suitable for shading top chrome colors after chroming. Can be top-chromed.

ON OTHER MATERIALS: Silk: Boiled-off liquor and sulphuric acid. Gloria: Acetic acid, the silk is very light; sulphuric acid, nearly equal.

PRINTING: Suitable on wool.

DISCHARGING: Will not strip with decroline. Color discharges with tin or zinc.

COMPETING PRODUCTS: Made in the United States by E. I. du Pont de Nemours & Co.

SAFFRANINE

(Schultz No. 679)

COMPOSITION: Azine type.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: On a tannin mordant. Acetic acid in the bath brightens the shade.

SHADE: Heliotrope.

SHADE BY GASLIGHT: Redder.

SOLUBILITY: Best at 140 deg. Correct with acetic acid.

LEVEL: With care.

FASTNESS TO:
Acid: Fast to acetic; bluer with mineral acids.
Alkali: Fast.
Chlorine: Destroyed.
Cross-Dyeing: Fair, topped with tannin.
Fulling: Fair, topped with tannin.
Ironing: Fast.
Light: Among the best of the basic colors.
Perspiration: Fast.
Steaming: Will not stand steaming.
Street Dirt: Sensitive.
Washing: Among the best of the basic colors.
Water: Among the best of the basic colors.
Sizing: Fair; better topped with tannin.

SENSITIVE TO METALS, LIME: Specially suitable for direct printing on cotton with tannin (on oiled material the shade is a trifle bluer), and also for silk and silk-cotton unions. These prints possess very good fastness to water. Sensitive to iron machines.

ON UNIONS: Cotton-silk unions: Dyed on substantive bottom.

ON OTHER MATERIALS: Wool: Not suitable; can be dyed neutral or with acetic; very fugitive to light. Silk: In soap bath; little used. Jute: Neutral at 140 deg. Paper: Used for pinks; used for cellulose and wood pulps; makes a cheap red with Orange RO.

PRINTING: On cotton, suitable. On silk, suitable.

DISCHARGING: Color discharges by chlorate process with sulphite of potash, tin or zinc. Discharges white with glucose soda-lye.

COMPETING PRODUCTS: Made in the United States by National Aniline & Chemical Company, under name of Saffranine A; E. I. du Pont de Nemours & Co., under name of Saffranine T; Calco Chemical Company, under name of Saffranine Y; Newport Chemical Works, under name of Saffranine Y.

SILK GRAY

(Schultz No. 631)

COMPOSITION: Azine.

SPECIALLY SUITABLE FOR: Silk and tannined cotton.

USUAL METHOD OF DYEING: On silk, with boiled-off liquor and sulphuric acid.

SHADE: Greenish shade of gray.

SHADE BY GASLIGHT: Unaltered.

SOLUBILITY: Good.

LEVEL: Dyes level.

EXHAUSTS: Very slowly.

FASTNESS TO:
Acid: Fast.
Alkali: Fast.
Ironing: Turns yellower.
Light: Relatively fast for basic color.
Perspiration: Fast.

Rubbing: Moderate.
Washing: Good on silk; bleeds on cotton.

ON OTHER MATERIALS: Suitable for jute and paper.

COMPETING PRODUCTS: Made in the United States by Newport Chemical Works, under name of Fast Silk Gray M; Calco Chemical Company, under name of Neutral Gray.

INDULINE
(Schultz No. 699)

COMPOSITION: Azine.

SPECIALLY SUITABLE FOR: Silk.

USUAL METHOD OF DYEING: Boiled-off liquor and sulphuric acid.

SHADE: Dull shade of blue.

SHADE BY GASLIGHT: Greener.

SOLUBILITY: Use plenty of hot water.

LEVEL: With care.

EXHAUSTS: Well.

FASTNESS TO:
Acid: Good against acetic and sulphuric.
Alkali: Turns much redder with soda and ammonia.
Carbonizing: Fast.
Ironing: Good.
Light: Fugitive.
Perspiration: Turns redder.
Rubbing: Crocks.
Scouring: Scours off.
Steaming: Fast to steaming.
Sulphur: Moderate.
Washing: Moderate.
Water: Moderate.

OTHER PROPERTIES: By boiling with alcohol the color becomes more soluble. Comes on market in two shades, a blue and a red.

ON OTHER MATERIALS: Wool: With Glauber salt and sulphuric acid; not very suitable. Cotton: Tannin mordant; dyes fairly well.

PRINTING: Suitable for silk.

DISCHARGING: Tin suitable for color discharge.

COMPETING PRODUCTS: Made in the United States by Newport Chemical Works, Inc., under name of Acid Blue R; National Aniline & Chemical Company, under names of Induline B and NT; Grasselli Dyestuff Corporation, under names of Induline 2B and R and Induline Spirit Soluble; Cincinnati Chemical Works, under names of Induline Spirit Soluble and Induline Water Soluble.

AMALTHION GREEN 4GY
(Schultz No. 709)

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Equal amount of sodium sulphide as color.

SHADE: Bluish green.

SHADE BY GASLIGHT: Brighter.

SOLUBILITY: Ten grams per liter.

LEVEL: Only fair.

EXHAUSTS: Fairly well.

FASTNESS TO:
Acid: Good against acetic; bluer and darker with sulphuric.
Alkali: Fast.
Boiling: Poor.
Carbonizing: Worse than 2G (S-746); bleeds into wool and turns blue.
Chlorine: Decomposed.
Cross-Dyeing: Bluer and duller.
Ironing: Ironed wet, the white is stained. Dry, O. K.
Light: Inferior to the Katigene Greens.
Perspiration: Fast.
Rubbing: Fast.
Washing: Fast.

SENSITIVE TO METALS, LIME: After-treated with chrome and copper, turns strongly toward blue. The fastness properties are not improved by after-treating. There is no reaction of formaldehyde on the shade of this color.

COMPETING PRODUCTS: Made in the United States by Amalgamated Dyestuff & Chemical Corporation (Selling Agents, John Campbell & Co.).

NEWPORT ANNOUNCES NEW BLUE AND GRAY

A leaflet has been issued by Newport Chemical Works, Inc., describing a new product, Newport Direct Blue BXG, said to be useful for the production of navy blue shades possessing moderate fastness to light, washing, cross dyeing and acid spotting. Its fastness to alkali spotting is described as good and its fastness to rubbing and steaming as excellent. Rayon dyes well to a good reddish blue, as does pure silk. Lustron and Celanese are tinted to a pinkish tone. Union materials of cotton and wool or cotton and silk are said to dye much redder and a little duller on the animal fiber. It may be discharged clear white with hydrosulphite.

Another Newport product recently brought out is Newport Neutral Gray GG Special, described as of particular interest as a self shade for the production of grays where very good fastness to washing and alkali is desired. It is said to have excellent fastness to rubbing, acid spotting and steaming. It is altered very little by hot pressing, and its fastness to light is said to be good for this class of color. It will discharge white with hydrosulphite.

Pure silk may be dyed either acid or neutral with this new Newport Gray. Stronger dyeings are produced from acid baths. Rayon, says the announcement, dyes well, while Lustron and Celanese are only stained.

The leaflet shows this Newport color on swatch bows in two strengths and gives complete dyeing directions and fastness properties.

NATIONAL ERIE BORDEAUX B

Among the recent additions to the National line of direct dyes is National Erie Bordeaux B. This new dye yields bluish-red tones on cotton and artificial silk, both viscose and Tubize, and will prove useful for the production of shades similar to wine, garnet, mulberry, etc., when used either as a self color or in combination.

This new product is said to possess excellent solubility, and dye level, described as of good fastness to light, and of general good fastness to both washing and crocking, properties which should suggest its use for many purposes. Owing to its dischargeability with hydrosulphite, it is recommended for all classes of cotton fabrics that are subjected to this process.

In the dyeing of unions, results are good; cotton is colored a slightly bluer shade than either silk or wool.

In general, this new dye is said to serve many purposes in the cotton and artificial silk dyehouse when a bluish-red is employed. It is fully described in National Bulletin No. 50, a copy of which can be obtained upon request from The National Aniline & Chemical Co.

A NEW BOOK ON AUTOMATIC CONTROL

The C. J. Tagliabue Manufacturing Company has issued a new and revised edition of its catalogue of automatic controllers for temperature, pressure, humidity, liquid level, condensation and other factors which are important to the success of industrial processes. In general the arrangement of the catalogue resembles that of preceding editions, but this edition is sixteen pages larger, having a total of eighty-four pages—and several more instruments are listed.

The most remarkable feature of this new catalog is a six-page introduction which is entirely new. It stresses the importance of automatic control in various industries, is written not so much in the style of a technical report as in the style of a magazine article, is profusely illustrated, and its general tone may be judged from the opening, which is as follows:

"Everything that we wear, nearly everything that we use, and most of what we eat, has passed through a number of processes.

"Ours is not merely a mechanical age—we live in a process civilization. This is the era of specialization, and processes have multiplied until a list of them would fill this catalog. Our material comfort rests indeed upon the success of all these many processes. This success always depends on the maintenance of proper conditions.

"The most important of these conditions is temperature. Next comes pressure; while humidity, duration, and other factors play important parts. The accurate and positive control of these conditions is, therefore, of the highest importance.

"Moreover, keenness of competition compels the elimination of waste, and with the growth of modern industries, thousands of engineers began to apply their skill to an extensive search for the one best condition—analyzing results until they proved, for example, not only that a temperature of exactly 208 deg. Fahr. resulted in the minimum cost of a certain process, but that a temperature of 206 deg. Fahr. or 210 deg. Fahr. brought about a reduction in the quality of the product, and consequently in its economic value. They showed also how lack of uniformity, even when slight, was costly. . . ."

There follows an interesting discussion of automatic control problems in a number of industries, and many actual cases are cited.

This book will be sent free of charge upon application to Automatic Controller Division, C. J. Tagliabue Manufacturing Company, 18-88 Thirty-third Street, Brooklyn, New York.

On September 1, Aniline Colors & Chemicals, Inc., was taken over by the Ciba Company of New York, with branches in chicago and San Francisco.

C. Leith Speiden has been appointed New York representative to the National Council of the United States Chamber of Commerce. He is a member of the well-known chemical house of Innis Speiden & Co.

The Loebl Dye Works, Roanoke, Va., has been organized with $25,000 capital. Joseph Loebl, president, and Robert Loebl, treasurer, to establish plant.

OFFICE MANAGER

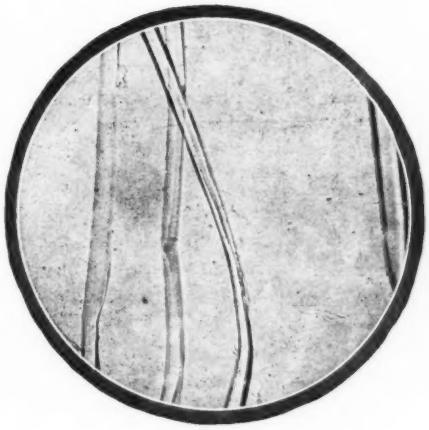
Office manager wanted for Chicago office of dyestuff and chemical manufacturers. Person desired who has practical knowledge and experience in the same industry. Reply Box 309, American Dyestuff Reporter.

TEXTILE CHEMIST

WANTED—Young Textile Chemist for research work in the chemical laboratory of a large silk dyeing concern. Reply to Box 310, American Dyestuff Reporter, giving full information regarding education, experience, age and salary desired.

CHEMIST

WANTED—Chemist in manufacturing concern where salary is not so much an object as a future. Must have experience with textile sizings. Give full particulars as to experience, salary to start, references, etc. Reply to Box 311, American Dyestuff Reporter.



The photomicrograph at the left, shows how clean the fibres come out when degummed in properly conditioned water. Clean fibres like these will make quality products.

The photomicrograph at the right, shows a faulty spot in silk that has been degummed in water containing a small amount of impurity. Note the deposits that cling to the fibres. These deposits caused by hidden impurities in the water, are the cause of rejections which have heretofore been difficult to trace.

Is Your Water Supply Working Against You?

WATER is your biggest raw material. It may seem to be perfectly clean and pure, yet it often contains dissolved substances that cause much trouble in manufacturing processes.

The best workmanship, the best raw materials, cannot do away with costly rejections of goods unless your water supply is free from impurities. But are you always certain it is?

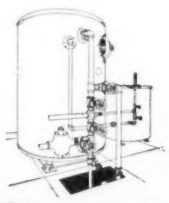
Just consider for a moment that just before it reaches the mill the water has come in contact with dead plants, leaves, soft rocks, limestone, and other impurities in the ground. It can't help picking up a lot of substances, some of which may be the very cause of various manufacturing troubles you are now having—difficulties that could perhaps be eliminated very easily after a careful study of your water supply.

Look at the two photomicrographs above. The right-hand one shows silk fibres that were degummed in untreated water. No one ever suspected there was anything wrong with the water, yet you can clearly see the deposits that were left on these fibres by the action of some substances that were dissolved in water.

Now look at the left-hand picture. These fibres were degummed in Permutit-conditioned water. Note how clean and uniform they are. The mill owner who gave us these materials saved thousands of dollars by conditioning his water supply, though he had no idea there was anything wrong with it until our engineers investigated.

How about your mill? Are you absolutely sure of your water supply? Are you confident it never changes, never contains harmful impurities?

It will pay you to read a copy of our booklet, "Reducing Textile Costs and Troubles." It contains a wealth of valuable information about the influence of water impurities on all kinds of textile manufacturing. No obligations —Write for it today.



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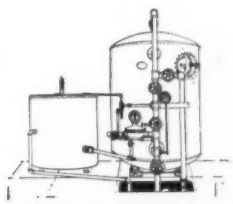

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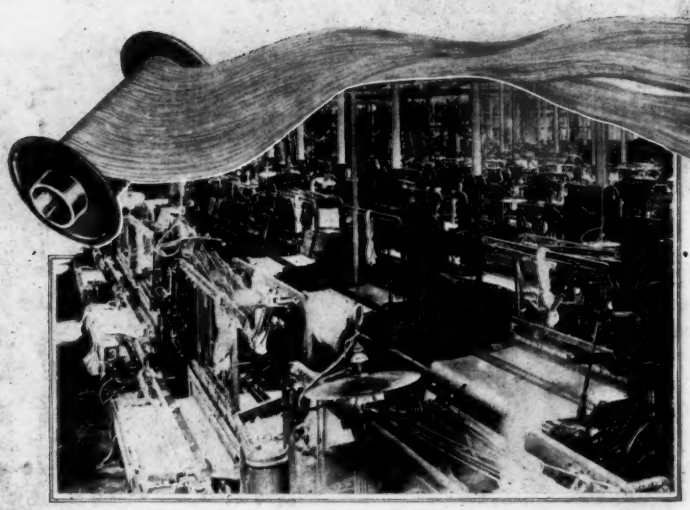

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